REMOVAL ACTION WORK PLAN

FAIRBANKS AND OHIO AUTOPARK
CHICAGO, ILLINOIS

Prepared by:
Conestoga-Rovers
& Associates

8615 West Bryn Mawr Ave.
Chicago, Illinois 60631

Office: 773-380-9933
Fax: 773-380-6421

FEBRUARY 2004
REF. NO. 17770 (2)
This report is printed on recycled paper.

CONESTOGA-ROVERS
& ASSOCIATES

8615 W. Bryn Mawr Avenue, Chicago, Illinois 60631-3501
Telephone: 773-380-9933 Facsimile: 773-380-6421

February 27, 2004

Reference No. 017770

Mr. Fred Micke
U. S. Environmental Protection Agency
Superfund Division Region 5
Emergency Response Branch
77 West Jackson Boulevard – SE-5J
Chicago, Illinois 60604

VIA COURIER

Dear Fred:

Re: Removal Action Work Plan
SW Corner – E. Ohio Street & N. Fairbanks Court
Chicago, Illinois

Pursuant to our discussion on February 24, 2004, please find attached four copies of the above-captioned work plan for U.S. EPA's review. The attached plan contemplates excavation of soil through the entire property in 18-inch vertical intervals similar to other removal sites in the Streeterville area. I believe further details are fully provided by the attached comprehensive plan.

As always, please don't hesitate to contact me if you've any questions or need further information.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

B. Clegg

Bruce Clegg

BCC/ko/3
Attachments

c.c.: Thomas Carey/Mike Ohm, Bell, Boyd & Lloyd (w/att. x 4)
Wilson Funkhouser, Funkhouser Vegosen Liebman & Dunn Ltd. (w/att. x 4)
Julian Hayward, CRA (w/att. x 1)

TABLE OF CONTENTS

TABLE OF CONTENTS

Page

LIST OF FIGURES
(Following Text)

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 GENERAL

Conestoga-Rovers & Associates (CRA) was retained by Bell, Boyd & Lloyd L.L.C. and Funkhouser Vegosen Liebman & Dunn Ltd. to develop a Removal Action (RA) Work Plan for remediation of property located at the southwest corner of East Ohio Street and North Fairbanks Court in Chicago, Illinois (Property or Site). The Site is currently occupied by an active pay parking lot, a fast food restaurant, and a vacant metal building. Remediation of the Site is to be undertaken in support of planned redevelopment including construction of a high-rise, multi-use building. The remediation program is being undertaken on a voluntary basis under agreement with the United States Environmental Protection Agency (U.S. EPA).

The Site is located in proximity to the Lindsay Light Superfund Site and the Lindsay Light II Site where soils containing radioactive thorium have been previously reported. The Lindsay Light Chemical Company is the former maker of incandescent gas mantles used for home and street lighting. Based on documentation reviewed by CRA, the Lindsay Light Chemical Company manufactured mantles circa 1906 until 1933 at 161 East Grand Avenue. The process of gas mantle manufacturing involves dipping fabric into solutions containing thorium nitrate and small amounts of cerium, beryllium and magnesium nitrates and forming the material into the finished product. The principal ingredient in thorium nitrate is radioactive thorium, specifically thorium-232. On June 3, 1993, the U.S. EPA and the Illinois Department of Nuclear Safety (IDNS) conducted a joint investigation at the Lindsay Light II Site. This investigation verified the presence of radioactivity at levels above natural background levels. Radiation levels up to 280 micro-Roentgens per hour (μR/hr) were measured. Background measured at the Lindsay Light II Site, was 20 μR/hr.

On September 28 and 29, 2000, the U.S. EPA conducted a radiation walkover survey of the Site (245 East Ohio Street) to determine whether there were any elevated radiation readings at the surface that might indicate the presence of subsurface radioactive materials. According to a letter issued by the U.S. EPA, dated December 1, 2000, elevated readings were found in three areas located on the Property. A copy of the letter is provided in Appendix A. Elevated readings were detected at an area along the west side of the Site. The other two areas were reported to be small and were located near the south-center of the lot and at the southeast corner of the lot. According to the U.S. EPA's letter, the survey indicated that radioactive material was present under the asphalt in one area (west side of the Property) and possibly in the other two areas. The U.S. EPA determined that the radiation levels around the fast food restaurant and in the attendant's booth were normal background levels. The U.S. EPA concluded that none of these areas pose an immediate health hazard. However, the risk for contamination of people and equipment would rise if the asphalt were removed, exposing underlying soils.

The presence of soils containing elevated levels of radioactive thorium on the Property was confirmed during an investigation completed in February 2001. Subsequently, CRA conducted a more comprehensive Property Investigation at the Site in April 2001 to evaluate the Property from the perspective of assessing subsurface radiation relative to naturally occurring background radiation levels in local unimpaired soils and to evaluate the potential volume of soil containing elevated radiation levels. The results of the April 2001 investigation reconfirmed the presence of radioactive materials in the soil in at least two areas along the western portion of the Site at levels above the cleanup level established by the U.S. EPA for the Lindsay Light Site of 7.1 pCi/g of total radium (Ra-226 + Ra-228).

1.2 PURPOSE AND ORGANIZATION OF WORK PLAN

The purpose of this work plan is to provide information on the Site background, previous studies, and procedures for undertaking remediation of the Site.

This report is organized as follows:

- Section 1: Introduction;
- Section 2: Presents information relating to Site background and history;
- Section 3: Presents information relating to previous investigations;
- Section 4: Presents a description of procedures for the remediation activities;
- Section 5: Presents project reporting requirements;
- Section 6: Presents Work Plan approval conditions;
- Section 7: Presents Agency assurances and acknowledgements; and
- Section 8: Presents Final Report and Closure Letter requirements.

2.0 SITE BACKGROUND AND HISTORY

As part of previous work to evaluate Site background and history, CRA conducted an assessment of publicly available database information, and conducted an inspection of the Site in October 2002 (hereafter referred to as "Site inspection"). The Site inspection was part of a Phase I Environmental Site Assessment performed in accordance with ASTM Standard E1527-00. The database information that was reviewed by CRA is identified and discussed herein, but has not been reproduced due to volume.

2.1 SITE LOCATION

The Site is located at the southwest corner of East Ohio Street and North Fairbanks Court in Chicago, Illinois. A Site location map is provided on Figure 2.1. A Site plan is provided on Figure 2.2.

2.2 SITE OVERVIEW

The Site consists primarily of an approximately 32,700 square foot asphalt-paved active pay parking lot located at the southwest corner of East Ohio Street and North Fairbanks Court in Chicago, Illinois. Improvements to the Site consist of three buildings including a fast food restaurant (Hot Diggity Dog), a vacant metal building, and an attendant's booth for the parking lot attendants. The fast food restaurant and vacant building are prefabricated metal buildings constructed in approximately 1993. A small stockpile of apparent construction debris (concrete rubble) was observed at the west end of the Site during the Site inspection. Based on documentation reviewed by CRA, several addresses have been used for the Site including the following: 253 East Ohio Street; 251 East Ohio Street (currently Hot Diggity Dog); 247 East Ohio Street (currently vacant metal building); 245 East Ohio Street; 243 East Ohio Street; and 242 to 256 East Grand Avenue.

2.3 ENVIRONMENTAL SETTING/ADJACENT PROPERTIES

The Site is rectangular in shape and is located in a commercial area of Chicago, Cook County, Illinois. East Ohio Street and North Fairbanks Court provide access to and egress from the Site. The Property is situated on relatively flat terrain. No stressed vegetation, stained soils, or surficial evidence of fill, other than the stockpile of apparent construction debris located at the west end of the Site, were observed on the Property during the Site inspection.

The Site is bordered:

- to the north by East Ohio Street with a vacant lot and lofts/offices located beyond;
- to the west by businesses including Emilios Tapas Restaurant, Grand Ohio Condo, and Fast Signs with lofts located above the businesses;
- to the south by East Grand Avenue with a parking garage located beyond;
- to the east by Fairbanks Court and beyond by the Chicago Time Life Office Building; and
- to the northeast by Holiday Inn and McClurg Court Center.

No evidence of adverse impact to the Site from the adjacent properties was observed by CRA during previous Site inspections. The following adjacent properties were listed in environmental databases searched previously:

- The Lindsay Light II Site is located on the southern adjacent property and was on the CERCLIS list. The Lindsay Light II Site is a public parking lot located at 316 East Illinois Street. The three-acre lot is bordered by Grand Avenue, Illinois Street, McClurg Court, and Columbus Drive. Records show that the Lindsay Light II Site originally housed a stable, which was later used as a laboratory/processing facility by the former Lindsay Light Chemical Company.
- Holiday Inn is located northeast of the Site at 300 East Ohio Street and was listed in the RCRIS-SQG Report.
- The Chicago Time Life Building is located on the eastern adjacent property, east of North Fairbanks Court and was listed in the RCRIS-SQG Report.
- A vacant parking lot located at 255 East Ohio Street was listed in the Illinois Underground Storage Tank (UST) Report as having three removed USTs. The exact location of this parking lot is unknown by CRA.
- An Amoco Service Station was historically located on the northern adjacent property at 252 East Ohio Street and was listed in the Illinois UST Report as having three removed USTs. The Amoco Station was also listed in the Illinois Leaking Underground Storage Tank (LUST) Report as having a closed status. This Amoco Service Station is no longer present at the 252 East Ohio Street address.

No other adjacent properties were listed in any of the databases searched.

During CRA's Property Investigation conducted in April 2001, two main stratigraphic units were encountered within the upper 13 feet of soil beneath the Site. The first unit consisted of fill material that was encountered in all of the soil borings. The fill material consisted mainly of silt, sand, and clay with varying amounts of gravel. In addition, the fill material also contained varying amounts of rubble consisting of brick fragments, concrete and minor amounts of slag, coal, glass, and wood. The fill material was underlain by native sand. The sand consisted mainly of fine-grained dense sand that was tan or gray in color. Based on documentation reviewed by CRA, groundwater flow direction beneath the Site is in a southeasterly direction. The Site is not located within a flood hazard area. No surface water is located on the Property. The closest body of water to the Site is the Chicago River located approximately 1,000 feet south of the Site. Lake Michigan is located approximately 2,000 feet east of the Site.

2.4 SITE HISTORY

2.4.1 HISTORICAL OWNERSHIP

Based on documentation reviewed by CRA, a filling station historically occupied the northern portion of the Site circa 1950 until 1975. Based on a review of Sanborn Maps, a warehouse and garage occupied the southern portion of the Site circa 1950 until sometime between 1950 and 1974. According to Site personnel, structures at the Site were used as a horse barn sometime in the 1940s.

Based on a review of city directories, Robertson Auto Repair/Robertson Hans Garage historically occupied the 245 East Ohio Street address. Suker Jacob R MD and Lemmy's Devilishly Hot Dogs historically occupied the building currently occupied by Hot Diggity Dog (251 East Ohio Street). Fairbanks and Ohio Auto Park have occupied the Site (243 East Ohio Street) circa 1961 until the present. No information was available on the other associated addresses.

2.4.2 SANBORN FIRE INSURANCE MAP ASSESSMENT

Sanborn Fire Insurance Maps assist in the identification of historical land use and commonly indicate the existence and location of aboveground and underground storage tanks, structures, improvements, and facility operations. Sanborn Maps for the years 1903, 1906, 1927, 1950, 1974, 1988, 1990, and 1994 were available from EDR and reviewed by CRA. The following is a summary of observations based on review of the Sanborn Maps:

1903: The 1903 Sanborn Map shows the Site to be vacant and undeveloped. Ohio Street is observed north of the Site with vacant land located beyond. A street referred to as "Boulevard" is observed east of the Site with vacant land located beyond. Indiana Avenue is observed south of the Site with a store located beyond. Vacant land is observed west of the Site with stores located beyond.

1906: The 1906 Sanborn Map shows the Site to be vacant and undeveloped. Ohio Street is observed north of the Site with vacant land located beyond. Fairbanks Court is observed east of the Site with a vacant lot located beyond. A vacant lot is observed west of the Site with warehouses and stores located beyond. Indiana Avenue is observed south of the Site. The property located south of the Site, south of Indiana Avenue is not indicated on the map.

1927: The 1927 Sanborn Map shows the northeastern portion of the Site to be vacant and undeveloped. The remainder of the Site consists of unidentified two-story structures without basements. The remaining adjacent properties are consistent with the 1906 Sanborn Map.

1950: The 1950 Sanborn Map shows the northern portion of the Site to be occupied by a filling station (253 East Ohio Street) and a two-story garage (245-251 East Ohio Street). The southern portion of the Site is occupied by a private garage (245-248 East Grand Avenue), a furniture warehouse (250-252 East Grand Avenue) and a "garage capacity 25 cars" (254-256 East Grand Avenue). East Ohio Street is observed north of the Site with a filling station located beyond at the northwest corner of North Fairbanks Court and East Ohio Street. North Fairbanks Court is observed east of the Site with a filling station (301 East Ohio Street) located beyond. East Grand Avenue is located south of the Site. A stove testing facility (228-230 East Grand Avenue), a motor freight station (232-234 East Grand Avenue) and a building used for magazine distribution on the first floor and fixture storage on the second floor (238-240 East Grand Avenue) is located southwest of the Site. The property located south of East Grand Avenue is not indicated on the map.

1974: The 1974 Sanborn Map shows the Site to be occupied by a filling station at the north end of the Site. The southern portion of the Site is vacant. The filling station located north of the Site at the northwest corner of North Fairbanks Court and East Ohio Street that was observed in the 1950 Sanborn Map is no longer present; however, a filling station is observed at the northwest corner of this property. North Fairbanks Court is observed east of the Site with the Chicago Time-Life Office Building located beyond. The western adjacent property is vacant with Underwriters Laboratories located beyond. East Grand Avenue is located south of the Site. The property located south of East Grand Avenue is not indicated on the map.

1988: The 1988 Sanborn Map shows the Site to be occupied by two buildings and a parking lot. A filling station is observed north of the Site, north of East Ohio Street in the central portion of the lot. The remaining adjacent properties remain consistent with the 1974 Sanborn Map.

1990: The 1990 Sanborn Map shows the Site to be consistent with the 1988 Sanborn Map. East Ohio Street is observed north of the Site with a parking lot located beyond. A Holiday Inn is observed northeast of the Site at the northeast corner of North Fairbanks Court and East Ohio Street. A parking lot is observed west of the Site. The remaining adjacent properties remain consistent with the 1988 Sanborn Map.

1994: The 1994 Sanborn Map shows the Site and adjacent properties to be in the same basic configuration as the 1990 Sanborn Map.

2.4.3 PROPERTY TITLE SEARCH

CRA contracted NCO Financial Systems, Inc. (NCO) to conduct a search of property title records and other documents (lease agreements, easements, etc.) dated from April 21, 1949 to August 30, 2002, associated with ownership or occupation of the Site. Based on the original Site address information provided to CRA, the title search was conducted for the 247 East Ohio Street address only. The following entities were reported to be associated with ownership or occupation of the above-mentioned Site address or portions of the Site during the specified time periods:

Grantor	*Grantee*	*Date*
D.S. Boyd, et al	Underwriters Laboratories, Inc.	April 21, 1949
Underwriters Laboratories, Inc. and American National Bank Trust Number 8239	Henry R. Levy, formerly Studebaker Sales Company	May 19, 1959
Henry R. Levy Company	Mae Daum	January 31, 1972
Mae Daum	Exchange National Bank and Trust, as Trustee under Trust Number 26143	November 3, 1976
Exchange National Bank and Trust, as Trustee under Trust Number 26143	Blanche Kirian	November 3, 1976

Blanche Kirian	American National Bank and Trust Company of Chicago, as Trustee under the provisions of a certain Trust Agreement dated the 27th day of October 1976 and known as Trust Number 39369	November 3, 1976

No leases, easements, or environmental liens were reported to be associated with the Site.

2.4.4 AERIAL PHOTOGRAPH ANALYSIS

Aerial photographs assist in the identification of Site features and outdoor activities of potential environmental concern. Aerial photographs for the years 1952, 1962, 1972, 1988, and 1999 were obtained from Historic Information Gathers (HIG) and were reviewed by CRA. All of the aerial photographs were reviewed at a scale of 1 inch equals approximately 500 feet. The following is a summary of CRA's interpretation of features observed on the aerial photographs:

1952: The 1952 aerial photograph shows the Site to be developed with unidentified buildings. A vacant lot is located north of the Site, north of East Ohio Street. North Fairbanks Court is located east of the Site with what appears to be a filling station located beyond. Unidentified buildings are located west of the Site and south of the Site, south of East Grand Avenue.

1962: The 1962 aerial photograph shows the Site to be developed with a building and a parking lot encumbered with numerous vehicles. What appears to be a filling station is located north of the Site, north of East Ohio Street. The remaining adjacent properties are consistent with how they appeared in the 1952 aerial photograph.

1972: The 1972 aerial photograph shows the Site to be in the same basic configuration as the 1962 aerial photograph. What appears to be a parking garage is observed south of the Site. A building (currently the Chicago Time Life Office Building) is observed east of the Site, east of North Fairbanks Court. An unidentified building (possibly a filling station) and several vehicles are observed north of the Site, north of East Ohio Street. A parking lot and building containing several businesses are observed west of the Site.

1988: The 1988 aerial photograph shows the Site and adjacent properties to be consistent with the 1972 aerial photograph.

1999: The 1999 aerial photograph shows the Site to be developed with a parking lot and the current on-Site structures. A parking lot is observed south of the Site, south of East Grand Avenue. The Chicago Time Life Office Building is observed east of the Site, east of North Fairbanks Court. A parking lot and a building containing several businesses are located west of the Site. What appears to be a vacant lot is located north of the Site, north of East Ohio Street.

2.4.5 CITY DIRECTORIES REVIEW

City directories provide a listing of current and historic occupants of a building address. A city directory search was conducted by EDR from the earliest available directory to the present. Directories were available and were reviewed by EDR at approximately 5 year intervals starting in 1923 and ending in 1999.

The Site address (245 East Ohio Street) was listed in the 1931 city directory as Robertson Auto Repair Shop/Robertson Hans Garage. The Site address (251 East Ohio Street) was listed in the 1961 city directory as Suker Jacob R MD, in the 1976, 1981, and 1986 city directories as Lemmy's Devilishly Delicious Hot Dogs, and in the 1993 city directory as Hot Diggity Dog. The Site address (243 East Ohio Street) was listed in the 1961, 1966, 1971, 1976, 1981, 1986, and 1993 city directories as Fairbanks and Ohio Auto Park. No information for any of the other Site addresses or adjacent properties was reported in the city directory search.

2.5 EXISTING OPERATIONS AND FEATURES

2.5.1 GENERAL

The Site is currently occupied by an active pay parking lot, a fast food restaurant, and a vacant metal building.

2.5.2 UTILITY SERVICES

Commonwealth Edison (ComEd) provides electricity to the Site through overhead service connections. The fast food restaurant (Hot Diggity Dog) is heated by natural gas while cooling is provided by a roof-mounted central air-conditioning unit. Stormwater from the Site is collected through storm drains located along the roadways and discharges to the municipal storm sewer.

The City of Chicago provides potable water and sanitary sewer services to the Site. Site personnel were not aware of any on-Site septic systems or potable water wells either in use currently or historically at the Site. No evidence of on-Site potable water wells or septic systems have been observed.

2.5.3 UNDERGROUND STORAGE TANKS (USTs)

According to Site personnel, there currently are no USTs in service or located at the Site. No evidence of on-Site USTs (e.g., vent or fill pipes, etc.) was observed by CRA during the Site inspection.

The Site address (247 East Ohio Street) was listed in the Illinois LUST Report as Dancona [sic] & Company and was reported as having an open status.

Based on documentation reviewed by CRA, a filling station historically occupied the northern portion of the Site circa 1950 until 1975. Reportedly, one 1,000-gallon and two 550-gallon USTs were removed from the Site in February 1994 by RTE Environmental Solutions, Inc. Upon removal of the USTs, petroleum-degraded soils were observed by a representative of the Office of the State Fire Marshall (OSFM) overseeing the UST removals. In accordance with State and Federal regulations, a release was reported to the Illinois Emergency Management Agency (IEMA) and incident number 94-0293 was issued for the Site. Subsequent soil and groundwater investigations were conducted based on the reported release. This investigation is discussed further in Section 3.2.

2.5.4 WASTEWATER/SEWERS

No process wastewaters are generated at the Site. Wastewater generated at the Site consists of domestic wastewater from the buildings located on the Property. Wastewaters are discharged to the municipal sanitary sewer system.

2.5.5 STORMWATER

Stormwater runoff from the Property includes rainwater from the building roofs, parking lot, and the surrounding grounds. Stormwater from the Property is directed towards storm drains located in the adjacent roadways.

2.5.6 ASBESTOS CONTAINING MATERIALS (ACM)

An asbestos survey has not been conducted for this Site; however, potential ACM observed previously include ceiling tiles and 12-inch by 12-inch floor tiles in the fast food restaurant and 12-inch by 12-inch floor tiles in the vacant building. These materials have been observed to be in good condition.

3.0 INVESTIGATIVE HISTORY

3.1 OVERVIEW

Previous investigations at the Site, conducted by others and known to CRA, include the following:

- investigation of the potential petroleum releases associated with the former filling station located on the northern part of the Site, as reported in April 1997; and
- radiation walkover survey conducted by U.S. EPA in September 2000.

Site primary investigations conducted by CRA include the following:

- property walkover investigation (February 2001); and
- *subsurface* investigation (April 2001).

The results of these investigations, which are also described in the Phase I Environmental Site Assessment (October 2002), are discussed in the following subsections.

3.2 FOCUSED SITE INVESTIGATION SUMMARY REPORT [SCHRACK APRIL 1997]

A *Focused Site Investigation Summary Report* was prepared by Schrack Environmental Consulting, Inc. (Schrack) in April 1997. Schrack's report discussed an investigation regarding the potential presence of petroleum contamination resulting from a former filling station operated at the Site known as 243 East Grand Avenue. According to Schrack's report, Schrack completed fifteen soil borings and six groundwater monitoring wells at the Site in order to define the extent of contamination present and determine the level of remedial efforts necessary to obtain a No Further Action determination from the State. The soil boring and groundwater monitoring well locations are illustrated on Figure 3.1. The results of the on-Site soil and groundwater sampling as summarized by Schrack verified benzene, toluene, ethylbenzene, and xylene (BTEX) concentrations below the applicable Tier 1 Soil and Groundwater Remediation Objectives (Tiered Approach to Corrective Action Objectives for Residential Properties - Inhalation and Ingestion Values) in all fifteen soil samples and in five of the six groundwater samples. A groundwater sample collected from a monitoring well installed at the northeast corner of the Site (MW-2) contained a benzene concentration in excess of the identified Remediation Objectives.

Based on the initial analytical results, Schrack completed three additional soil borings and groundwater monitoring wells in North Fairbanks Court to investigate subsurface conditions in the downgradient direction from the northeast corner monitoring well location. However, due to the presence of numerous underground utilities in East Ohio Street, soil borings and monitoring wells could not be completed in the upgradient direction from the northeast corner monitoring well. According to Schrack's report, the results of the analyses completed on the additional soil and groundwater samples verified BTEX concentrations below the applicable Tier 1 Soil and Groundwater Remediation Objectives. Schrack's report also indicated that the shallow groundwater aquifer flows in a southeasterly direction. Moreover, Schrack's report stated that the northeast corner monitoring well (MW-2) is located hydraulically upgradient from the underground storage tank systems formerly located at the Site. Schrack concluded that the benzene discovered at the northeast corner of the Site may have been caused by releases from a former LUST site located directly upgradient of the Site (or from dispersion of dissolved-phase petroleum contaminants into the shallow aquifer caused by releases from the former pump island and underground piping associated with the UST systems formerly operated at the Site). Schrack recommended that a Focused Site Investigation Summary Report and Remedial Action Plan be submitted to the Illinois Environmental Protection Agency (IEPA) for review and approval.

A comparison of the groundwater analytical results from Schrack's report to the current groundwater standards listed in Table E of Appendix B of 35 Illinois Administrative Code 742 - Tiered Approach to Corrective Action Objectives (TACO) indicates that five of the monitoring wells had exceedences of the Class I or Class II groundwater standards. The benzene concentration in several monitoring wells (MW-1, MW-2, MW-3, MW-6, and MW-7) exceeded the Class I groundwater standard. Excluding the results from MW-1, the benzene concentration from the remaining four monitoring wells also exceeded the Class II groundwater standard. The groundwater results from MW-2 also exceeded the Class I and II groundwater standards for toluene, ethylbenzene, and xylenes. It should be noted that the City of Chicago has a Memorandum of Understanding (MOU) with the IEPA prohibiting groundwater use within the City, thereby eliminating the groundwater exposure pathway.

CRA also compared Schrack's soil analytical results to the current TACO Tier I soil remediation objectives. This comparison confirmed Schrack's conclusion that the soil analytical results were below the TACO Tier I soil ingestion and inhalation remediation objectives. However, the concentration of ethylbenzene in the soil sample collected from soil boring DKSB4 exceeded the soil component of the groundwater ingestion exposure route for Class I groundwater. Notably, the MOU between the City of Chicago and IEPA will support the elimination of this exposure pathway.

CRA is in the process of obtaining closure approval for the former petroleum storage facilities from IEPA. Closure (in the form of a No Further Remediation letter) is expected to be obtained prior to commencement of removal activities pursuant to this RA Work Plan.

3.3 RADIATION WALKOVER SURVEY [U.S. EPA SEPTEMBER 2000]

A radiation walkover survey of the Site was conducted by U.S. EPA on September 28 and 29, 2000. According to the letter from U.S. EPA dated December 1, 2000 (provided in Appendix A), the procedure was as follows:

- measurements were taken using a probe held about 6 inches off the ground, along parallel lines approximately 3-4 feet apart, to assess the range of values, and determine areas of elevated radiation levels;
- 30 second counts, in contact with the ground, were taken at regular intervals (in the center of each parking space and down the centerline of the driveway) to quantify the radiation level;
- measurements were also taken at selected spots where initial readings were distinct from background levels; and
- exposure rate measurements were made at the hot dog restaurant and in the attendant booth.

The results from the survey were stated as follows: "Readings ranged from 1,890 counts per 30 seconds to 4,225 counts per 30 seconds. Spots along the west side reached as high as 16,061 counts per 30 seconds. All readings were on contact. Exposure rate measurements ranged from 5 to 6 micro-Roentgen per hour."

Based on the survey results, U.S. EPA determined that elevated readings were observed in three locations: one of these is distinctly elevated from background levels and is toward the west side of the lot, in the parking spaces near the building wall; and the other two seem to be small and are near the south-center of the lot and on the southeast corner of the lot, along the barricade. It was further indicated that the levels at the hot dog stand and the attendant booth were considered to be normal background and none of the areas pose an immediate health hazard but the risk would rise appreciably if the asphalt was removed.

3.4 PROPERTY INVESTIGATION [CRA FEBRUARY 2001]

CRA completed a limited Property Investigation in February 2001 at the Site (247 East Ohio Street). The purpose of this investigation was to evaluate the Site from the perspective of assessing subsurface radiation relative to naturally occurring background radiation levels in local unimpaired soils. Investigative activities undertaken consisted of the following:

- completion of a surficial walkover survey of the Property;
- installation and sampling of four soil borings at locations where elevated radiation levels were measured during the walkover survey;
- down-hole measurement of radiation levels within the completed soil borings; and
- analysis of one soil sample using high-resolution gamma spectroscopy to identify and measure radiation levels.

The results of the surface survey demonstrated radiation levels above normal background. The down hole measurements were elevated above levels usually attributable to background concentrations of naturally occurring radioactive materials (NORM). The gamma spectroscopy results showed concentrations of radium-226 and radium-228 surrogates in excess of the U.S. EPA's local action level of 7.1 pCi/g (total radium).

A copy of the CRA report is provided in Appendix B.

3.5 SUBSURFACE INVESTIGATION [CRA APRIL 2001]

CRA completed a limited Subsurface Investigation in April 2001 at the Site (247 East Ohio Street). The purpose of this investigation was to further evaluate subsurface radiation levels and to evaluate the potential volume of soil containing elevated concentrations of radioactive material. Investigative activities completed by CRA consisted of the following:

- installation and sampling of 59 soil borings (see Figure 3.2) at locations where elevated radiation levels were observed during the walkover survey and at subsurface areas anticipated to be disturbed by Draper and Kramer's development of the Site;

- downhole measurement of radiation levels within the completed soil borings;
- analysis of 94 soil samples using high-resolution gamma spectroscopy to identify concentrations of radioactive material; and
- surveying of the completed soil boring locations.

The results of this investigation confirmed the presence of radioactive materials in the soil in at least two areas along the western portion of the Site at levels above the cleanup level established by the U.S. EPA. The location of this area is shown on Figure 3.3, which illustrates the contoured radiation count readings from the investigation.

A copy of the CRA report is provided in Appendix C.

3.6 SUMMARY OF EXISTING SITE ENVIRONMENTAL CONDITIONS

The environmental condition of the Site is potentially affected by the past use of the Property. The primary known or suspected historic impacts are as follows:

- the presence of radioactive material associated with the historic Lindsay Light operations, located nearby;
- the presence of historic fill material; and
- the previous use of a portion of the Site as a filling station.

The Site is located near the Lindsay Light Superfund Site and the Lindsay Light II Site where soils containing radioactive thorium have been previously reported. The presence of soils containing elevated levels of radioactive thorium on the Property was confirmed during an investigation completed by CRA in February 2001. Subsequently, CRA conducted a limited Subsurface Investigation at the Site in April 2001 to evaluate the Property from the perspective of assessing subsurface radiation relative to naturally occurring background radiation levels in local unimpaired soils and to evaluate the potential volume of soil containing elevated radiation levels. The results of the April 2001 investigation confirmed the presence of radioactive materials in the soil in at least two areas along the western portion of the Site at levels above the cleanup level established by the U.S. EPA for the Lindsay Light Site (7.1 pCi/g total radium).

Significant amounts of fill material are known to have been added historically to raise the grade of city streets above the original natural marshy ground. It is probable that the Site is underlain by fill material dating from the 19th century. Also, the Site is located in an area that was destroyed during the Great Chicago Fire of 1871. Varying amounts of rubble consisting of brick fragments, concrete, and minor amounts of slag, coal, glass, and wood were identified in soil borings advanced at the Site during the limited Subsurface Investigation conducted by CRA in April 2001. Moreover, and as discussed previously, the fill contains radioactive materials with total radium activity in excess of U.S. EPA's clean up standard established for the Lindsey Light Site of 7.1 pCi/g (total radium).

Other environmental conditions, summarized previously, are related to petroleum hydrocarbon usage on, and adjacent to, the Site. It is noted that CRA is in the process of obtaining closure approval for the former petroleum storage facilities from IEPA.

4.0 SOIL REMOVAL AND RESTORATION

4.1 OVERVIEW

The results of previous investigations indicate that some soil is present on Site, which exceeds the U.S. EPA local action level of 7.1 pCi/g (total radium). The estimated extent and location of the soil contamination is indicated on Figure 3.3. Based on borehole data the depth of historic fill material on site is estimated to range from approximately 7 to 12 feet and averages approximately 9.2 feet.

The remediation activities will be focused on the removal for off-Site transportation and disposal of radiological-impacted soil/fill material. It is expected that the excavation and screening of soils will extend through the complete thickness of the fill material over the entire Site area, down to the depth where underlying native materials are encountered, estimated at approximately 9.2 feet below grade.

The excavation may also extend into the underlying native material depending on the results of verification testing to be performed. As described previously, the underlying native soils comprise a mixture of fine to medium grained sand and small amounts of gravel. It is not expected that groundwater will be encountered within the depth of the excavation.

Subject to detailed assessment and an agreement on cost sharing between the principal parties, it is expected that soil exceeding the action level be removed from the Site for transportation to and disposal at the Envirocare disposal facility (Envirocare of Utah, Inc.). Confirmatory testing of excavated areas will be undertaken in order to verify completion of removal. Following this, the Site will be restored to a condition suitable for the subsequent development phase. A qualified remedial contractor, selected through a contractor procurement process, will undertake the work.

The general sequence of activities, will be as follows:

- preparatory work, including obtaining required permits and approvals, utility clearances, lane closures and other traffic controls (if required);
- mobilization of materials, equipment and temporary support facilities, and Site security implementation including fencing and barriers for noise/dust suppression;
- Site surveying, clearing existing structures and fence removal;
- removal of asphalt, and walkover survey for presence of impacted soil/fill;

- sheeting/shoring and excavation, staging of equipment for controlled excavation, identification, and removal of impacted soil/fill to required depth;
- confirmatory soil sampling and analysis;
- backfilling and Site restoration; and
- project closeout for subsequent development activities.

For purposes of the excavation program, the Site will be divided into a number of areas for sequencing of activities. The number and layout of the areas will be determined based on the logistics of simultaneous excavation and management of stockpiled material, and maintenance of temporary facilities, etc. This is subject to further evaluation and discussion with the selected remedial contractor. It is expected that the southwest portion of the Site ("Area 1"), where elevated radiation levels have been identified from previous investigations, will be identified as a single area to be excavated first. During excavation activities in a given area, the remaining areas will be used for support/staging purposes.

The activities outlined above are discussed in further detail in this section of the RA Work Plan.

Supporting plans, including the Construction Quality Assurance Plan (CQAP), Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), and Health and Safety Plan (HASP) are provided as appendices to this RA Work Plan.

4.2 ORGANIZATIONAL STRUCTURE AND SITE MANAGEMENT

CRA will provide the overall management of the project on behalf of the client group. Independent subcontractor support will be utilized for specific tasks and activities (e.g., testing and laboratory services). As noted above, a suitably qualified remedial contractor will undertake the work. U.S. EPA will provide oversight of the project.

The project organization is represented graphically on Figure 4.1. The responsibilities of the primary project personnel are outlined below.

U.S. EPA will be represented by Fred Micke, On-Scene Coordinator (OSC).

The client group will be represented by Thomas Carey of Bell, Boyd & Lloyd L.L.C., and Wilson Funkhouser of Funkhouser Vegosen Liebman & Dunn Ltd. who will be responsible for communications between the client group members and the project team and for reviewing project deliverables to ensure conformance with client objectives.

The CRA project manager will have overall responsibility for work plan development and implementation. The CRA project manager will be the primary point of contact between the client's project manager, the project team and the U.S. EPA OSC.

The CRA project coordinator will assist the CRA project manager and will be responsible for carrying out the daily functions associated with work plan activities and report generation. The project coordinator will be assisted by a project engineer, who will together work closely with the various team leaders and contractor representatives.

Other primary personnel include the Contractor's project manager, site superintendent, and Health and Safety Officer (HSO), CRA's Site engineer and the project Quality Assurance Officer. Subcontract support will be provided to CRA by RSSI of Morton Grove, Illinois.

4.3 PERMITS

Permits and/or approvals will be obtained as required for undertaking the removal action work and associated activities. Procedures for development and completion of permit applications will be discussed with individual issuing authorities during the preparation stages of the RA.

Permit and approval requirements that may be necessary include:

- demolition permit;
- excavation permit;
- street/sidewalk closure permit;
- consultation with utility authorities and companies;
- consultation with City of Chicago Department of Environment; and
- consultation with City of Chicago Department of Transportation.

4.4 UTILITY LOCATION AND CLEARANCE

Utility location maps will be obtained and compiled during the preparation stages of the RA. This will include natural gas, water, sewer, telephone/telecommunication, cable television and electrical power. This information will be obtained from utility companies or the respective designated utility location service, e.g., Chicago Utility Alert Network (DIGGER).

The utility information will be reviewed with respect to Site conditions (i.e., presence of gas meters, manholes, catch basins, water valves, protruding conduits, power poles, etc.). This information will be used to assist in final planning for excavation and related activities.

Prior to any intrusive work, requests will be made to the relevant authorities to mark utility locations in the field. Measures will be taken to protect any utilities that potentially conflict with the excavation activities.

4.5 MOBILIZATION

Mobilization of equipment and materials to the Site will be undertaken in stages, corresponding to the work activity being undertaken. Initial mobilization will include temporary facilities and control measures (e.g., temporary fencing, barriers, and personal hygiene and decontamination facilities). In conjunction with this, equipment required for demolition of existing structures will be mobilized.

Following the demolition and removal of Site structures, additional equipment will be mobilized as necessary for the removal of asphalt pavement material and placement of sheeting/shoring. An assessment of nearby buildings that are potentially affected by excavation and sheeting/shoring activities will be undertaken in advance.

Following placement of sheeting/shoring, remaining equipment required for the removal of asphalt pavement material, soil excavation and staging task will be mobilized.

Upon completion of the soil excavation task, equipment will be mobilized for backfilling operations and removal of any remaining sheeting/shoring.

Concurrent with the general sequence of tasks outlined above, pieces of equipment that are not needed will be demobilized from the Site, following decontamination as required.

4.6 SITE SURVEYING, CLEARING AND FENCE REMOVAL

Prior to commencement of Site clearing, a survey will be completed. This will include:

- layout of utility locations and site boundaries;
- establishment of control points for Site grid layout;
- location of existing surface features, such as existing buildings, structures, fencing, etc; and
- photographic record of pre-construction conditions.

The Site survey will be documented in the form of a Site drawing (CAD file format) and digital photograph file (electronic format).

Site clearing will involve demolition and removal of existing structures and fencing. All above ground materials from demolition removal will be taken from the Site and, following screening, disposed as either demolition waste or non-hazardous waste.

4.7 ASPHALT PAVEMENT REMOVAL AND WALKOVER SURVEY

4.7.1 ASPHALT PAVEMENT REMOVAL

Asphalt pavement material will be removed from the Site in stages, according to plans to be developed with the selected remedial contractor. Generally, it is expected that asphalt pavement removal, and subsequent excavation activities, will be undertaken in Area 1 first. After excavation work is completed in Area 1, work in the remaining areas will be undertaken. Area 1 and areas that are excavated subsequently will then become available to receive clean fill material from within the Site as backfill.

The removed asphalt material will be field-screened to determine radiation levels at the point of excavation. Material that exhibits elevated readings will be placed in a segregated stockpile area. Subject to testing and confirmation, this material will be disposed of along with the radiologically-impacted soil to Envirocare. All remaining material will be loaded directly into suitable containers (e.g., roll off boxes) for subsequent removal to an off-Site recycling or disposal facility.

4.7.2 WALKOVER SURVEY

After removal of the asphalt pavement material in each area, a walkover survey will be conducted to determine radiation levels at the exposed surface. The purpose of the survey is to identify potentially impacted material for subsequent excavation.

For purposes of the survey, grid lines will be established at 5-m spacing. The locations will be established with ground layout survey techniques and marked with stakes/flagging and paint. Gamma count values will be recorded at each node (i.e., at 5-m intervals) and within each grid. The methodology for the field-screening is provided in the FSP and QAPP.

4.8 SOIL EXCAVATION AND STAGING

4.8.1 GENERAL

Excavation of soil/fill material will be undertaken following the asphalt pavement removal and walkover survey within each excavation area. Excavated material will be segregated and temporarily staged on site pending determination of disposal requirements.

The horizontal limits of excavation on the north, east and south sides of the Site will be to the edge of the vertical shoring driven beyond (between one and six inches) the sidewalk closest to street. The horizontal limit of excavation on the west side of the Site (adjacent to the Grand Ohio Building), will be to the vertical shoring driven somewhat east of the property line.

The vertical limit of the excavation will be to the base of the fill material overlying native materials, at minimum. Further excavation into the underlying native material may be necessary, depending on the results of verification testing at the base of the excavation and other factors, such as the presence of groundwater. The use of sheeting and shoring will be necessary to allow excavation to be undertaken along the Site perimeter.

The procedures for the above activities are presented in the following subsections.

4.8.2 SHEETING/SHORING

Vertically driven sheeting and/or pilings ("sheeting/shoring") will be utilized to: (1) provide the necessary shoring to support excavation / Site development activities; and (2) define the horizontal limits (boundaries) of necessary remedial activities. Sheeting and/or piling types will be selected and placed in accordance with appropriate construction and engineering practices. Sheeting/shoring on the west side of the Site (adjacent to the Grand Ohio Building) will be installed adjacent to and within the western property boundary of the Site. Sheeting/shoring on the northern, eastern, and southern boundaries of the site is anticipated to be installed somewhat beyond (between one (1) and six (6) inches) the edges of the sidewalks closest to the adjacent streets. Excavations for remedial purposes will be within the vertical boundaries of the sheeting/shoring installed. No excavations for remedial purposes will be required for areas outside the boundaries of the sheeting/shoring installed.

4.8.3 EXCAVATION ZONES AND SEQUENCING

As stated previously, it is expected that the Site will be divided into several areas, with Area 1 being excavated first followed by subsequent areas until the entire site has been excavated down to native materials. The horizontal limits of the excavation will extend to the limits of driven vertical shoring/sheeting. No excavation or remediation of soils beyond the driven shoring/sheeting will be undertaken. The general sequence of activities at each area will be essentially the same. Asphalt pavement will be removed, followed by the walkover survey. The soil will then be excavated in lifts not exceeding 18 inches. The material that appears to be impacted, on the basis of field-screening results, will be segregated from the remaining material. Following removal of the first lift, the exposed surface will be re-surveyed, using the same techniques as the initial walkover survey. The next lift will be excavated and segregated. This process will continue downward until native material or groundwater is reached, whichever occurs first. At this point field screening will be performed and verification samples will be collected. The need for further excavation within the boundaries of driven shoring/sheeting (into native materials beneath the Site) will be discussed with U.S. EPA before proceeding.

4.8.4 STAGING OF EXCAVATED MATERIAL

Generally, the excavation activity within each area will yield two stockpiles, one for impacted material and one for non-impacted material, based on field screening results. In both cases, the stockpiled material will be placed on sheeting material to protect underlying clean surfaces, as needed. The stockpiles will be covered with sheeting material during non-working hours and periods of inclement weather, to protect against wind and rain.

4.8.5 TESTING AND DISPOSAL

The excavated stockpiled material will be sampled and analyzed to determine radiation levels relative to the criterion of 7.1 pCi/g (total radium). The material that exceeds the criterion will be removed from Site for transportation to and disposal at Envirocare's Utah facility. The remaining material may be used for backfilling purposes on Site, subject to an assessment of engineering properties. Excavated material that passes the cleanup criterion, but is unsuitable for use as backfill, will be taken from the Site and disposed of as appropriate.

4.8.6 DUST SUPPRESSION

Appropriate dust suppression measures will be employed through the duration of the excavation, staging and backfilling activities. Potential dust generation in open excavation areas will be controlled through the use of appropriate dust suppressants (e.g., water, calcium chloride). Stockpiles of excavated material will also be subject to application of dust suppressants as the stockpiles are being developed. In addition, the stockpiles will be covered with sheeting material as described earlier, during non-working hours and periods of inclement weather.

4.8.7 VEHICLE DECONTAMINATION

Vehicles that enter the Site and come in contact with potentially contaminated soil/fill material will be surveyed and decontaminated, as necessary, to remove particulate prior to leaving the Site. This will be done using high-pressure water spray at a temporary decontamination pad. Washwaters from the decontamination pad will be collected and contained for disposal. The washwater will be tested and filtered, if necessary, to permit disposal in accordance with the requirements of the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC).

4.8.8 MONITORING

Monitoring will be conducted during intrusive activities to ensure adequate protection of Site workers and the general public. This will include on-Site air monitoring, dosimetry testing and perimeter air monitoring. Procedures for these monitoring activities are included in the HASP.

4.9 CONFIRMATORY SAMPLING AND ANALYSIS

4.9.1 OVERVIEW

Sampling and analysis of soil/fill material will be undertaken to determine disposal requirements and post-excavation conditions. In addition, field screening will be performed to identify areas of potential contamination that require segregation. The various types of testing to be performed are summarized below:

- field screening (asphalt pavement material);
- field screening (walkover survey and surface of each exposed lift);
- stockpile sampling; and
- base of excavation sampling.

Field screening techniques were discussed in previous sections and are described in the FSP and QAPP. Laboratory analysis of samples collected from stockpiles and base of excavation is described further below.

4.9.2 GAMMA SPECTROSCOPY

Gamma spectroscopy will be employed to analyze samples of stockpiled material and base of excavation samples. The stockpiled material will be accessed for sampling with the aid of the excavation equipment. The sample frequency will be approximately one composite sample per approximately 100 cubic yards of material. The base of excavation samples will be collected at a frequency of one composite sample per

100 square meters. The samples will be analyzed by RSSI. The procedures for sampling and analysis are provided in the FSP and QAPP.

4.9.3 U.S. EPA CONFIRMATION

If requested, confirmatory samples will be provided to U.S. EPA for testing purposes.

4.10 BACKFILLING AND RESTORATION OF EXCAVATED AREAS

4.10.1 OVERVIEW

Excavated areas will be backfilled with either on-Site material that has been designated as clean, based on analytical testing results, or imported clean backfill material. The backfill material will comprise free-draining granular sand or sand and gravel. Backfilling operations will be carried out such that adequate heavy vibration equipment is used to compact the material. The backfill will be placed in loose lifts not exceeding 1 foot in thickness, and will be compacted to a minimum of 95 percent standard Proctor maximum dry density (SPMDD). An engineer or technician will observe backfilling operations, and compaction testing will be performed at a sufficient frequency to document the placement and compaction results.

4.10.2 BACKFILL SOURCE VERIFICATION

Imported backfill material will be accepted from known sources and will be subject to inspection by CRA at the point of origin. In addition, testing of backfill material will be undertaken, if deemed necessary based on an assessment of the previous use of the site of origin.

4.11 TRAFFIC MANAGEMENT

During the removal program, the movement of vehicles to and from the Site will be managed, such that vehicles travel on pre-defined routes. These routes will be selected in consideration of factors such as ease of travel and adequacy to support loads. In addition vehicle movement will be scheduled to limit truck traffic to non-rush hour time (i.e., not 0730-0900 and 1630-1800), if possible.

5.0 PROJECT REPORTING AND COMMUNICATIONS

5.1 OVERVIEW

Project reporting will include the completion of weekly and monthly status reports during the progress of the work, and a final report at the completion of the remediation activities.

5.2 WEEKLY REPORTS

Weekly reports will be completed by Site personnel to document the progress of the work activities, and will include the following, in summary format:

- activities undertaken each day;
- walkover survey results;
- description of depths and limits of excavation, and pertinent observations;
- description of material handling and stockpiling;
- sample collection details;
- disposal information;
- air monitoring information; and
- other relevant comments and details.

These reports will be completed in a standard format and will be retained in the Site project file.

5.3 MONTHLY REPORTS

Monthly reports will be completed by the CRA project manager/project engineer. The monthly reports will include a written summary of the work performed. The monthly reports will include:

- weekly report information;
- summary of monitoring/testing results;
- summary of relevant correspondence and discussions;
- identification of issues to be resolved; and

- discussion of progress of work toward completion.

The monthly reports will be prepared by CRA and distributed to the U.S. EPA, the client, and the remedial contractor.

5.4 FINAL PROJECT CONSTRUCTION REPORT

At the completion of the remediation activities, a final report will be completed. The final report will provide a description of the activities undertaken and will summarize all relevant technical information, including testing results and disposal information. The report will serve as a record of the work completed and will be distributed to the client and U.S. EPA.

6.0 WORK PLAN APPROVAL CONDITIONS

6.1 OVERVIEW

U.S. EPA has been provided with ultimate Property development information, including use descriptions and building renderings. U.S. EPA is aware that the Property is slated for development as a mixed-use residential and commercial high-rise building. U.S. EPA is aware that in order for the development of the Property to proceed as planned, certain understandings, conditions, and protections must be met (or established) to satisfy potential investors and lenders, as well as to establish a minimum "comfort level" necessary to proceed with Property development activities.

6.2 WRITTEN APPROVAL

Upon negotiation and final determination of acceptability of this RA Work Plan, U.S. EPA will provide written approval of same.

6.3 ULTIMATE PROPERTY USE CONFIRMATION

U.S. EPA hereby confirms, by its approval of this RA Work Plan, that if the activities contemplated herein are performed to the reasonable satisfaction of U.S. EPA, the Property may be developed for mixed residential / commercial use.

6.4 RCRA COMPLIANCE CONFIRMATION

U.S. EPA hereby confirms, by its approval of this RA Work Plan, that work contemplated herein sufficiently addresses any potential outstanding issues under U.S. EPA's Resource Conservation and Recovery Act (RCRA) program.

6.5 PUBLIC AND ENVIRONMENTAL BENEFIT CONFIRMATION

U.S. EPA hereby confirms, by its approval of this RA Work Plan, that work contemplated herein will provide significant public and environmental benefits.

6.6 INTERGOVERNMENTAL AGREEMENT CONSISTENCY CONFIRMATION

U.S. EPA hereby confirms, by its approval of this RA Work Plan, that the work contemplated herein is consistent with any U.S. EPA intergovernmental agreements that may encompass the Site (e.g., MOU with the IEPA, IDNS, City of Chicago, etc.).

6.7 COMPLIANCE WITH LAWS CONFIRMATION

U.S. EPA hereby confirms, by its approval of this RA Work Plan, that, to its knowledge, the work contemplated herein is compliant with all applicable laws, guidance documents, etc.

7.0 AGENCY ASSURANCES AND ACKNOWLEDGEMENTS

7.1 OVERVIEW

As part of the overall thorium removal actions undertaken by the parties at the Site pursuant to this RA Work Plan, U.S. EPA has agreed to provide certain written assurances and acknowledgements upon successful completion of said removal actions to U.S. EPA's reasonable satisfaction. These assurances and understandings are reflected below. U.S. EPA understands and agrees that in order for development activities to move forward following successful completion of the activities referenced in this RA Work Plan, time is of the essence and that the written assurances reflected below must be issued and finalized within 60 days of approved completion of the activities specified herein.

7.2 WRITTEN VERIFICATION OF INNOCENT LANDOWNER STATUS

ALFRED E. D'ANCONA AND LAWRENCE R. LEVIN, TRUSTEES OF THE ALFRED E. D'ANCONA III TRUST, U/W/O HENRY R. LEVY and ALFRED E. D'ANCONA III and TERRI R. D'ANCONA, TRUSTEES OF THE H. RICHARD D'ANCONA CHILDREN'S TRUST, DATED JUNE 3, 1994 (herein collectively referred to as "D'Ancona") is the fee owner of the Property.

On January 28, 2003, D'Ancona, through its attorneys, provided U.S. EPA with a historical, factual, and legal analysis establishing that D'Ancona is what is commonly referred to as a "innocent landowner" pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") exception under 42 U.S.C. § 9607(b)(3). Upon successful completion of the activities referenced in this Removal Action Work Plan, U.S. EPA agrees to promptly issue a written verification that D'Ancona: (i) has established, by a preponderance of the evidence, the elements under 42 U.S.C. § 9607(b)(3) of CERCLA; (ii) has established that no "contractual relationship" exists for the purposes of 42 U.S.C. § 9607(b)(3) pursuant to 42 U.S.C. § 9601(35)(A)(iii); (iii) is not liable for any cleanup obligations at the Site that might be imposed under CERCLA based upon (i) and (ii) above; and (iv) is entitled to all recognized protections provided as a result of its confirmed status as an "innocent landowner" under 42 U.S.C. § 9607(b)(3), including protection against third-party CERCLA - related actions (either direct or based upon contribution). Said written verification will initially be issued by U.S. EPA in draft form similar to that included under Appendix H hereto, for review and comment by the parties to this RA Work Plan prior to issuance of the final verification.

7.3 WRITTEN VERIFICATION OF BONA FIDE PROSPECTIVE PURCHASER STATUS

Fairbanks Development Associates ("FDA") is the Site's developer and will obtain ownership of Property either prior to or upon completion of the activities specified in this RA Work Plan. Prior to transfer of said property, FDA (and D'Ancona) undertook various environmental and radiological investigations at the Site, including, in part, the following: (i) Phase I Environmental Site Assessment (ASTM E1527-00)(dated January 2003); (ii) A Limited Property Investigation Report (Radiological Walkover Survey and Soil Sampling)(dated December 4, 2002); and (iii) Radiological Soil Boring Investigative Data Report and CD ROM containing Gamma Monitoring Contours (August 30, 2003).

Upon successful completion of the activities referenced in this RA Work Plan, U.S. EPA agrees to promptly issue a written verification that FDA: (i) has established, by a preponderance of the evidence, that it is a "Bona Fide Prospective Purchaser" as defined at 42 U.S.C. § 9601(40); and (ii) is not subject to CERCLA liability as an owner or operator pursuant to 42 U.S.C. § 9607(r)(1). Said written verification will initially be issued by U.S. EPA in draft form similar to that included under Appendix I hereto, for review and comment by the parties to this RA Work Plan prior to issuance of the final verification of FDA's Bona Fide Prospective Purchaser status.

8.0 FINAL REPORT AND CLOSURE LETTER REQUIREMENTS

8.1 OVERVIEW

As stated in Section 5.4 above, a Final Report will be completed and submitted to U.S. EPA following completion of the activities reflected in this RA Work Plan. By its approval of this RA Work Plan, U.S. EPA agrees that it will review the Final Report on an expeditious manner and, upon reasonably concluding that the removal action work at the Site has been completed in accordance with the requirements of this RA Work Plan, will prepare a draft Closure Letter for the Site for review by the parties hereto, who will given an opportunity to comment on and suggest revisions to said Closure Letter.

8.2 CLOSURE LETTER THRESHOLD REQUIREMENTS

U.S. EPA has been informed and understands that any Closure Letter issued for the Property following the successful completion of the activities specified in this RA Work Plan will require certain minimal threshold requirements in order for subsequent Property development activities to proceed. These minimal threshold requirements are reflected below.

8.3 NO DEED RESTRICTIONS, CONDITIONS, OR LIENS

Any Closure Letter issued by U.S. EPA for the Site following completion of activities conducted pursuant to this RA Work Plan, and following U.S. EPA's approval of the Final Report relating to said activities, shall not contain any deed restrictions, liens, property use conditions, or any other limitation which would impact or impede contemplated Property development activities. To the extent U.S. EPA has incurred past costs associated with Site investigation or remedial activities, said past costs must be addressed and resolved to U.S. EPA's reasonable satisfaction prior to the issuance of said Closure Letter. U.S. EPA understands and agrees that a clean property title will be required to support contemplated Property development activities.

8.4 REMOVAL ACTION COMPLETION CONFIRMATION

Any Closure Letter issued by U.S. EPA for the Property following U.S. EPA's approval of the Final Report will include a statement that the activities undertaken by the parties at the Site were performed in accordance with the requirements of the RA Work Plan, and that U.S. EPA has reviewed and approved the Final Report, including the findings and conclusions contained therein.

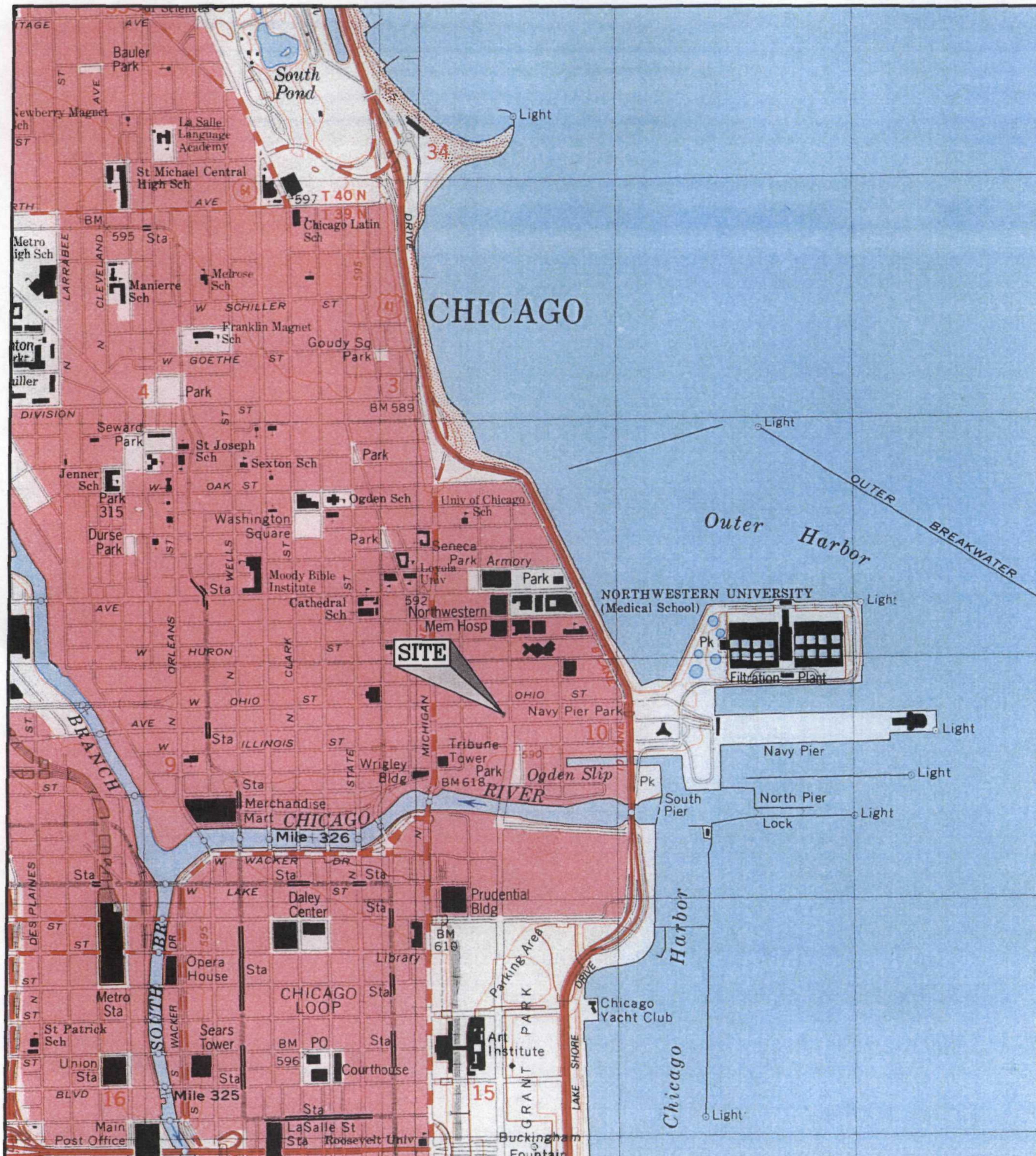
8.5 CLOSURE LETTER REVIEW

Any Closure Letter issued by the U.S. EPA will be initially issued in draft form to the parties hereto, who will be given an opportunity to make comments and negotiate reasonable edits and revisions to same.

8.6 TIME IS OF THE ESSENCE

U.S. EPA agrees that time is of the essence in issuance of the final Closure Letter for the Property following U.S. EPA's approval of the Final Report. U.S. EPA hereby agrees, by its approval of this RA Work Plan, that it shall expedite issuance of the original draft Closure Letter following its approval of the Final Report, and will also consider and turn-a-round subsequent drafts so that the final Closure Letter will be issued as expeditiously as possible.

FIGURES



BASE SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE; CHICAGO LOOP, ILLINOIS 1997

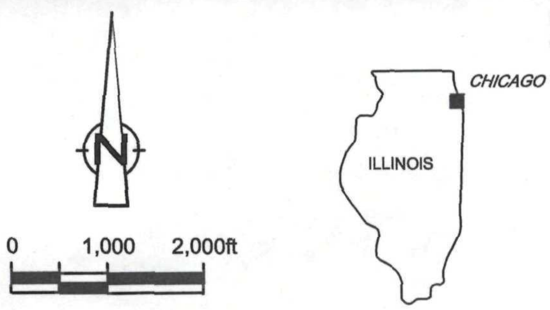


figure 2.1

SITE LOCATION
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(002)GN-CO001 FEB 25/2004

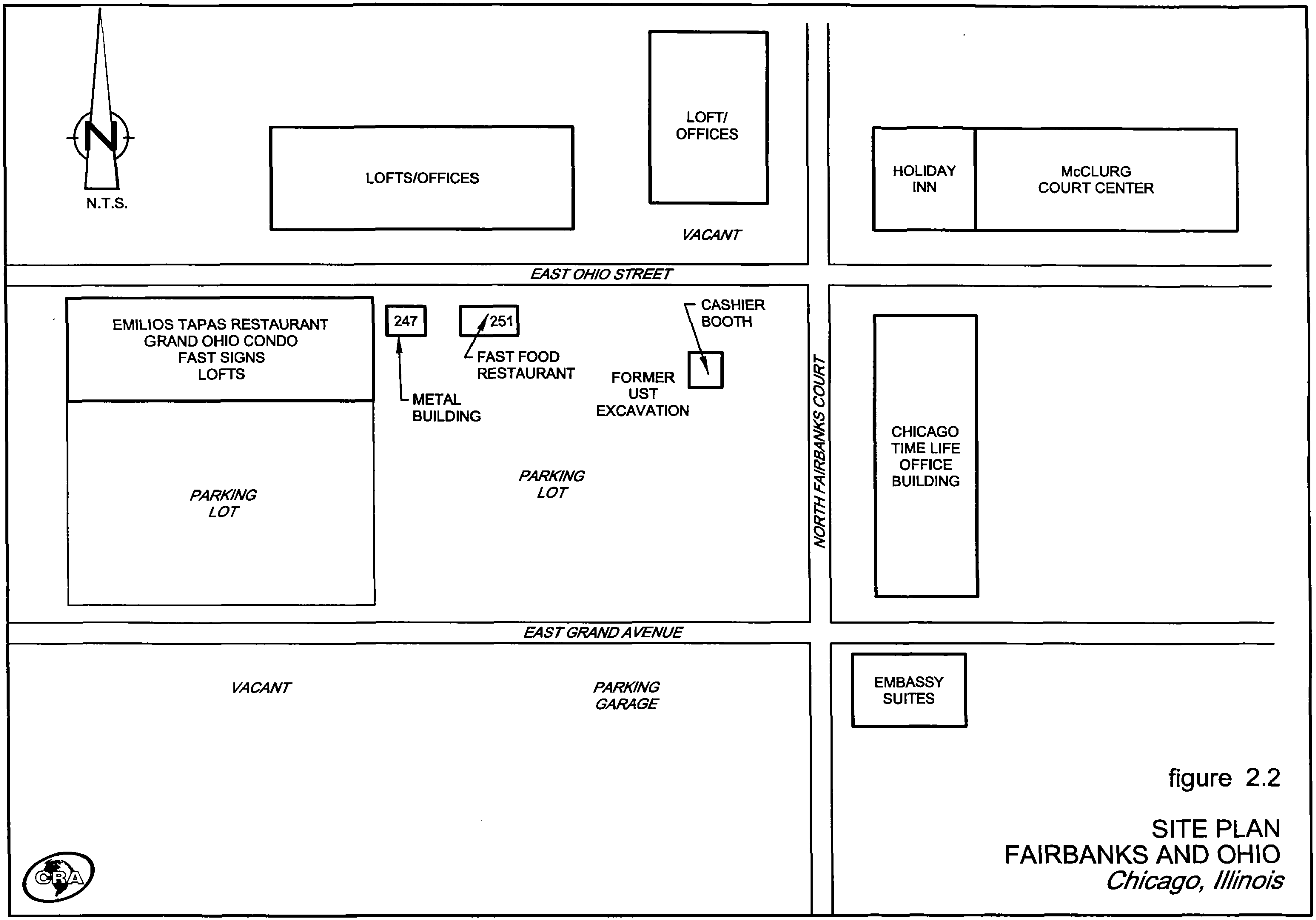


figure 2.2

SITE PLAN
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(002)GN-CO002 FEB 25/2004

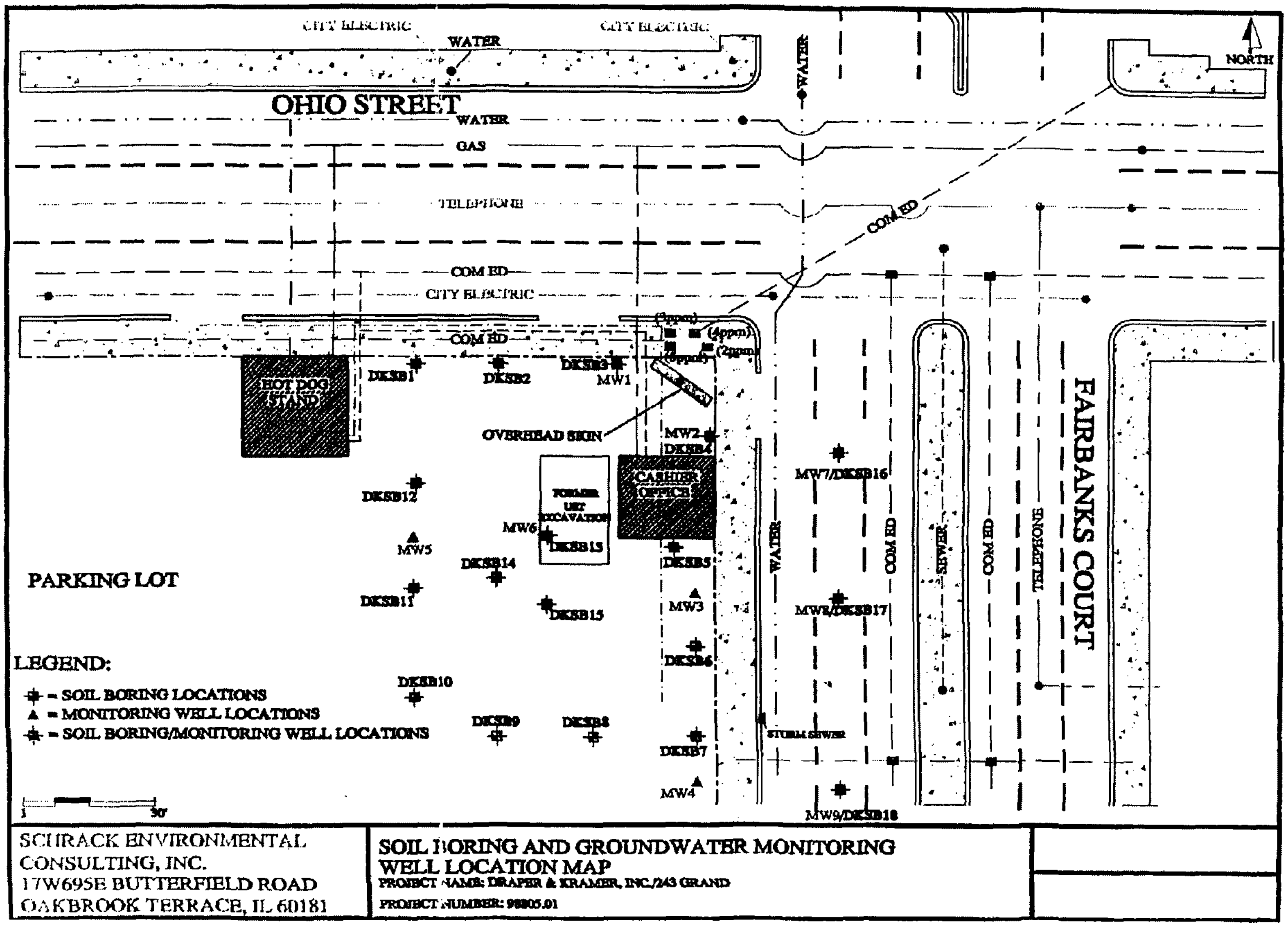
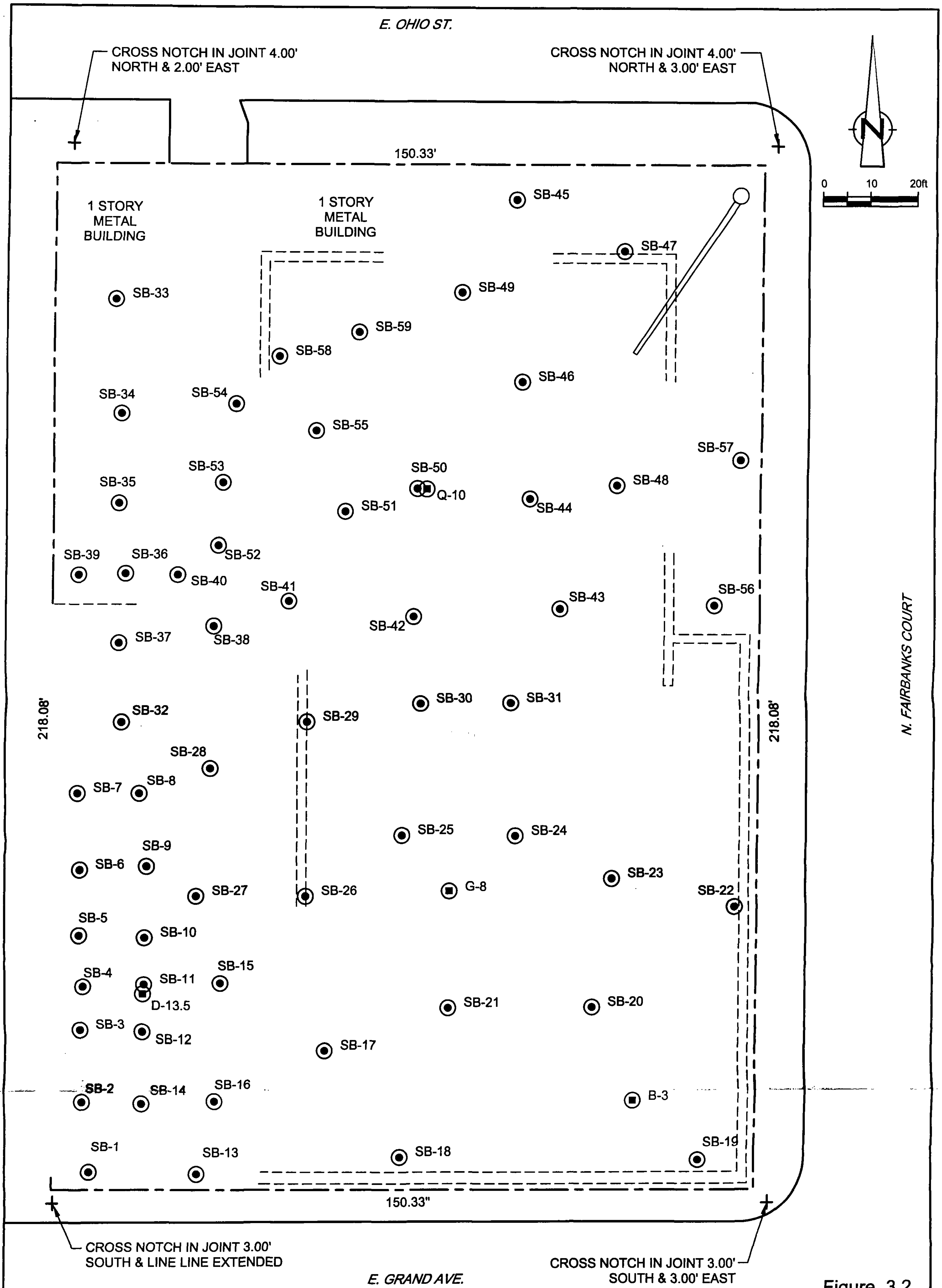


figure 3.1

SOIL BORING LOCATIONS
FORMER FILLING STATION
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(002)GN-CO003 FEB 25/2004



LEGEND

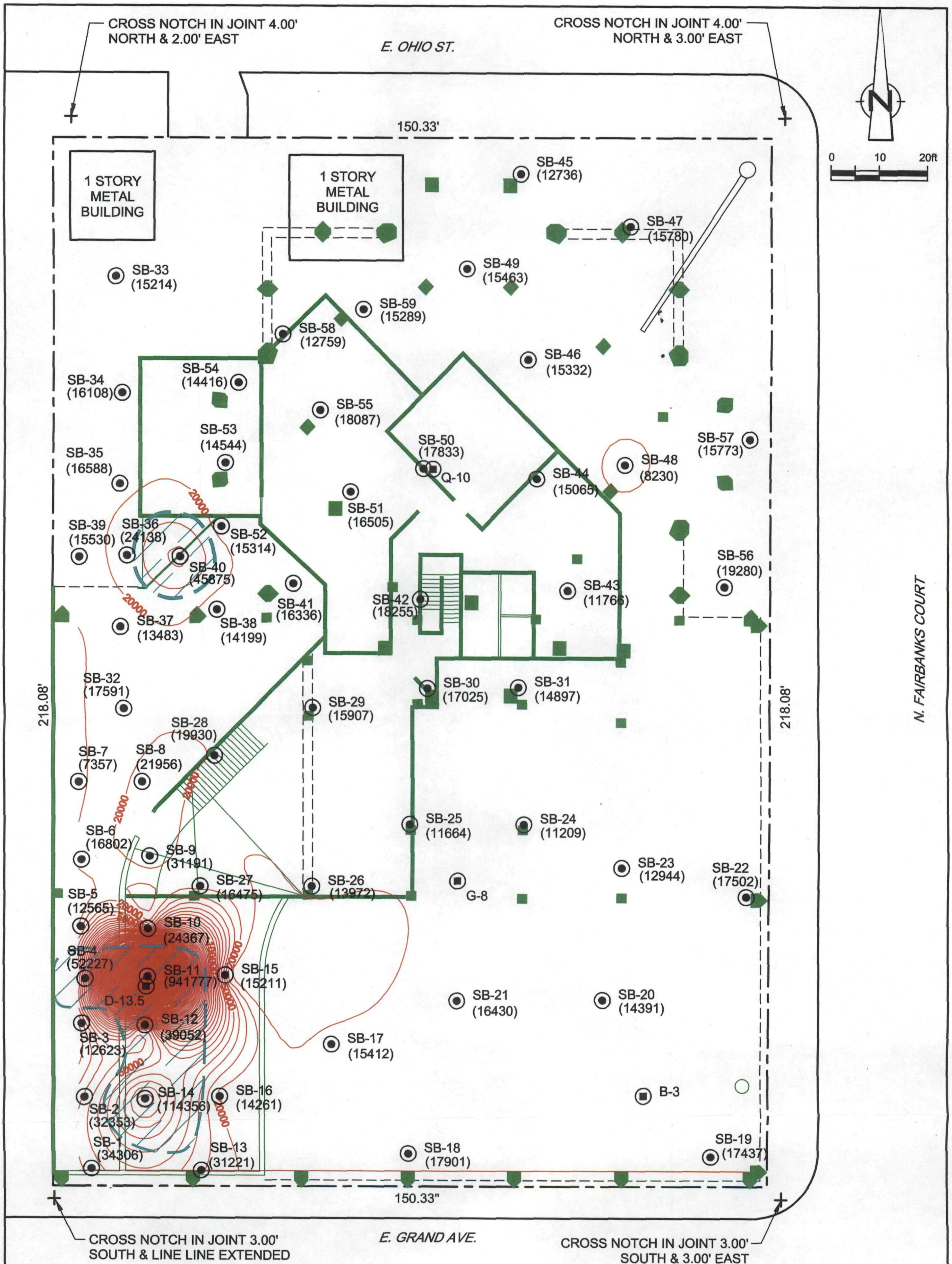
SB-13 ◉ SUPPLEMENTAL SOIL BORING LOCATION AND IDENTIFIER

B-3 ▣ INITIAL SOIL BORING LOCATION AND IDENTIFIER

Figure 3.2

SOIL BORING LOCATIONS
SUBSURFACE INVESTIGATION
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(002)GN-CO004 FEB 25/2004



LEGEND

SB-13 ⊙ SUPPLEMENTAL SOIL BORING LOCATION AND IDENTIFIER

(31221) DOWN-HOLE READING IN COUNTS PER MINUTE

AREA ASSUMED TO CONTAIN SOILS IN EXCESS OF USEPA CLEANUP OBJECTIVE

B-3 ▣ INITIAL SOIL BORING LOCATION AND IDENTIFIER

Figure 3.3

AREA OF ELEVATED RADIATION MEASUREMENTS IN SOIL
FAIRBANKS AND OHIO
Chicago, Illinois

CRA

17770-00(002)GN-CO005 FEB 25/2004

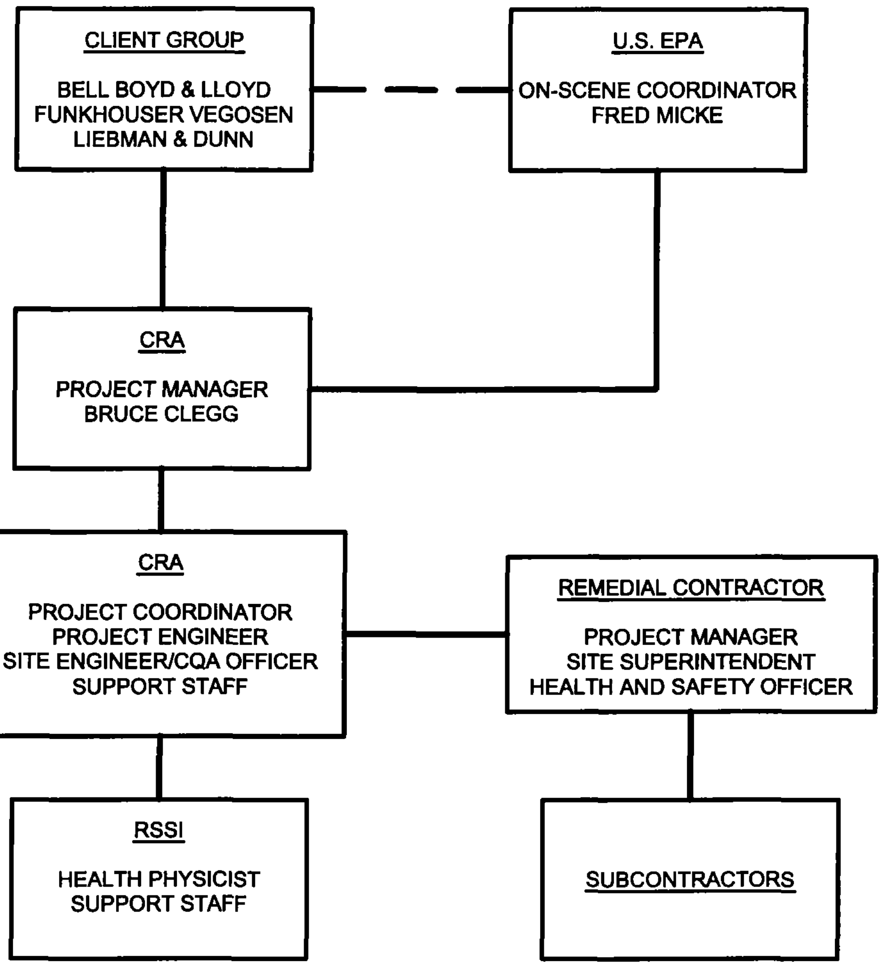


figure 4.1

PROJECT ORGANIZATION
FAIRBANKS AND OHIO
Chicago, Illinois

APPENDICES

APPENDIX A

U.S. EPA LETTER DATED DECEMBER 1, 2000

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF
SE-5J

DEC 01 2000

VIA FACSIMILE (312) 360-9340
AND U.S. MAIL

Mr. Alfred D'Ancona
D'Ancona and Company
111 West Jackson Street, Suite 1044
Chicago, Illinois 60604

RE: Walkover Survey of Parking Lot at 245 East Ohio, Chicago, Illinois

Dear Mr. D'Ancona:

On September 28-29,2000, U.S. EPA conducted a radiation walkover survey of your parking lot at 245 East Ohio to determine whether there were any elevated radiation readings at the surface that might indicate the presence of subsurface radioactive materials. There were elevated readings in three locations. One of these is distinctly elevated from background levels and is towards the west side of the lot, in the parking spaces near the building wall. The other two seem to be small and are near the south-center of the lot and on the southeast corner of the lot, along the barricade.

Our procedure for conducting the walkover survey was to first walk,* with the probe about 6 inches off the ground, the entire area along parallel lines about 3 - 4 feet apart, assessing background levels by looking at the lowest readings and looking for spots and regions of elevated radiation levels. We then took, for the record, 30 second counts, on contact with the ground, at regular intervals (in the center of each parking space and down the centerline of the driveway) to quantify the exposure environment. We also took readings at selected spots where initial readings were distinct from background levels. Furthermore, we took exposure rate measurements around the hot dog restaurant and in the attendants booth.

Readings ranged from 1,890 counts per 30 seconds to 4,225 counts per 30 seconds. Spots along the west side reached as high as 16,061 counts per 30 seconds. All readings were on contact. Exposure rate measurements ranged from 5 to 6 micro-Roentgen per hour.

This survey indicates that radioactive material is present under the asphalt in one area definitely and two other areas possibly. The levels around the hot dog restaurant and in the attendant's booth are levels we consider normal background. None of these areas pose an immediate health hazard but the risk for contamination of people and equipment would rise appreciably if the asphalt were removed. Shielding by the asphalt and any fill will reduce count rates and emissions from any underlying radioactive material could be difficult or impossible to detect. Moreover, removing the asphalt covering and spreading the soil over a larger area of the parking lot or to other locations could greatly expand the area of concern

If you decide to remove the asphalt, contact us prior to its removal so that we may observe your radiation surveillance and sampling for radionuclide identification and quantification or take our own measurements and sampling. Radiation surveillance should be conducted under a health and safety plan with disposal of any radioactive materials at a regulated disposal facility.

To help us better understand the conditions on this property, we would appreciate being furnished a copy of the environmental report prepared by Schrack Environmental.

Specific detection equipment used during this survey were a probe called a Bicron FIDLER Model G5 (S/N B089D), Ludlum Model 19 (S/N 66599), and the Ludlum Model 2221 survey meter (S/N 115168). These meters were calibrated on February 2, 2000, and February 3, 2000, respectively.

If you would like to discuss this matter further, please contact me at (312) 886-3601, or Fred Micke, On-Scene Coordinator, at (312) 886-5123, or Larry Jensen, Health Physicist, at (312) 886-5026. Please direct any legal questions to Mary Fulghum, Associate Regional Counsel, at (312) 886-4683.

Sincerely,

Verneta Simon

Verneta Simon
On-Scene Coordinator

cc: Naren Prasad, City of Chicago - Department of Environment

APPENDIX B

CRA REPORT OF PROPERTY INVESTIGATION [FEBRUARY 2001]

BC

CONESTOGA-ROVERS
& ASSOCIATES

8615 W. Bryn Mawr Avenue, Chicago, Illinois 60631-3501
Telephone: 773·380·9933 Facsimile: 773·380·6421
www.CRAworld.com

December 4, 2002

Reference No. 017770

VIA
OVERNIGHT COURIER

Mr. Fred Micke
U. S. Environmental Protection Agency
Superfund Division Region 5
Emergency Response Branch
77 West Jackson Boulevard – SE-5J
Chicago, Illinois 60604

Dear Mr. Micke:

Re: Property Investigation
Real Property Located at Fairbanks & Ohio
Chicago, Illinois

On behalf of Draper & Kramer, the prospective purchaser and the current property owner, Conestoga-Rovers & Associates (CRA) completed a limited Property investigation at the property located at 245 East Ohio in Chicago, Illinois (Property). The purpose of the Property investigation was to evaluate the Property from the perspective of assessing subsurface radiation relative to naturally occurring background radiation levels in local unimpaired soils. The most likely source of levels in excess of background could be due to the presence of thorium. The Property is located near the Lindsay Light Superfund Site and Lindsay Light II Site where soils containing levels of radioactive thorium have been reported. The primary objective of the limited Property investigation was to determine if soils beneath the Property contained concentrations of radioactive thorium above clean-up levels established by the United States Environmental Protection Agency (USEPA) for the neighboring Sites.

The Property is currently an active pay parking lot located in the Streeterville area of Downtown Chicago. The Property is bounded by East Ohio Street to the north, Fairbanks Court to the east, East Grand Avenue to the south and a high-rise condominium building to the west.

In brief, CRA's investigation confirmed the presence of radioactive thorium in the soil in at least one location beneath the Property at levels above the clean-up level established by the USEPA for the neighboring sites. The following discussion summarizes the activities completed during the investigation and presents the data obtained.

Work Scope

Field activities associated with the limited Property investigation were conducted on February 9, 2001. Investigative activities completed consisted of the following:

- completion of a surficial walkover survey of the Property;
- installation and sampling of four soil borings at locations where elevated radiation levels were measured during the walk over survey;
- down-hole measurement of radiation levels within the completed soil borings; and
- analysis of one soil sample using high-resolution gamma spectroscopy to identify and measure radiation levels.

RSSI of Morton Grove, Illinois was retained by CRA to provide radiation measurements during the Property investigation. Mid-American Drilling Services Inc. of Elburn, Illinois was retained by CRA to provide drilling services.

Walkover Survey

The walkover radiation survey was conducted early in the morning when the parking lot was nearly empty. The survey was conducted using a thallium-doped sodium iodide detector connected to a Ludlum Model 193 radiation meter. This meter is designed to detect low level gamma energies emitted from thorium or thorium-like elements. During the survey, the probe of the meter was positioned within inches of the asphalt surface with the detector directed downwards towards the ground. The meter, as used, is capable of generally measuring radiation levels from the surface to a maximum depth of two to three feet below grade depending on subsurface soil conditions.

An approximate nine-foot grid pattern was established across the Property. The walkover survey consisted of walking the grid pattern along the north and south orientation across the Property and measuring and recording the meter reading at each grid intersection. Additional measurements were taken between the grid intersections. A general background radiation level of 2,000 counts per minute (cpm) was measured across the Property.

Results from the walkover survey are summarized on Table 1. Radiation levels across the Property ranged form 2,000 to 8,500 cpm. An initial review of the data, identified nine areas of the Property which indicated areas of potential radiation anomalies. These areas were generally located at the grid intersections identified as Q10, O13, J12, D13, D12, C9, B3, G8, and O7. Figure 1 presents a contour map of the radiation measurements recorded during the walkover survey. This figure graphically illustrates radiation intensities immediately above the asphalt cover across the Property.

Soil Borings

A total of four soil borings (SB-B3, SB-8G, SB-Q10, and SB-D131/2) were advanced to measure radiation levels along the vertical profile of the open borehole. Soil boring maximum depths ranged from 7 to 11 feet below groundsurface (bgs). Soils borings were advanced using a rotary drill rig equipped with 4-3/4-inch hollow stem augers. Continuous split-spoon samples were collected during borehole advancement. Collected soil samples were inspected by a CRA geologist and described in accordance with the Unified Soil Classification System (USCS). Soil boring stratigraphic logs are provided in Attachment A.

Upon completion of the soil boring, a section of two-inch diameter PVC well casing was lowered into the borehole and the HSAs were retracted leaving the PVC casing in-place. An RSSI Health Physicist then measured radiation levels at one-foot intervals within the casing installed within the soil boring. Borehole radiation measurements were taken using a 1" x 1" sodium iodide meter probe attached to a Ludlum Model 2241 radiation meter. This meter, as used, is capable is capable of measuring radiation levels in the soil in a radius of approximately one to two feet around the soil boring. RSSI was only capable of measuring downhole radiation levels in soil boring SB-B3 and in a portion of soil boring SB-G8 before moisture caused an electrical short in the instrument. Once the measurements were completed, the PVC casing was removed from the borehole and used at the next soil boring location. Boreholes were backfilled with soil cutting, bentonite chips and capped with an asphalt patch.

Results from the downhole radiation survey are provided in RSSI's report provided in Attachment B. Downhole measurements in excess of twice the background levels were recorded near the surface at soil borings SB-B3 and SB-G8.

Soil Analysis

Three soil samples where retained for analyses from soil boring SB-D13-1/2. This location represented the area with the highest reading measured during the walkover survey. The soil sample collected from the 1-3 foot bgs interval was analyzed by RSSI using high-resolution gamma spectroscopy.

RSSI's analytical report for the sample analyzed is included in Attachment B.

The USEPA has relied upon a soil radium standard for uranium and thorium sites codified at Part 40, Title 192 of the Code of Federal Regulations (40 CFR 192). This standard is 5 picocuries per gram (pCi/g) of total radium (radium-226 plus radium-228) over background. The USEPA set the background radium level in the area at 2.1 pCi/g. Therefore the USEPA clean-up level is 5 + 2.1 pCi/g or 7.1 pCi/g. Analytical results from RSSI on the soil sample collected from the 1-3 foot bgs interval of SB-D13 ½ detected the surrogates for radium-226 at 152 pCi/g and radium-228 at 433 pCi/g for a total of 585 pCi/g.

Conclusions

Results from the limited investigation completed at the Property have confirmed the presence of radioactive thorium in the soil in at least one location beneath the Property at levels above the clean-up level established by the USEPA. Moreover, the results of the surface survey indicate the presence of radioactivity above anticipated background conditions at several locations.

If you have any questions, please call me at (773) 380-9933.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

B. Clegg

Bruce Clegg

BCC/lg/1
Attachments

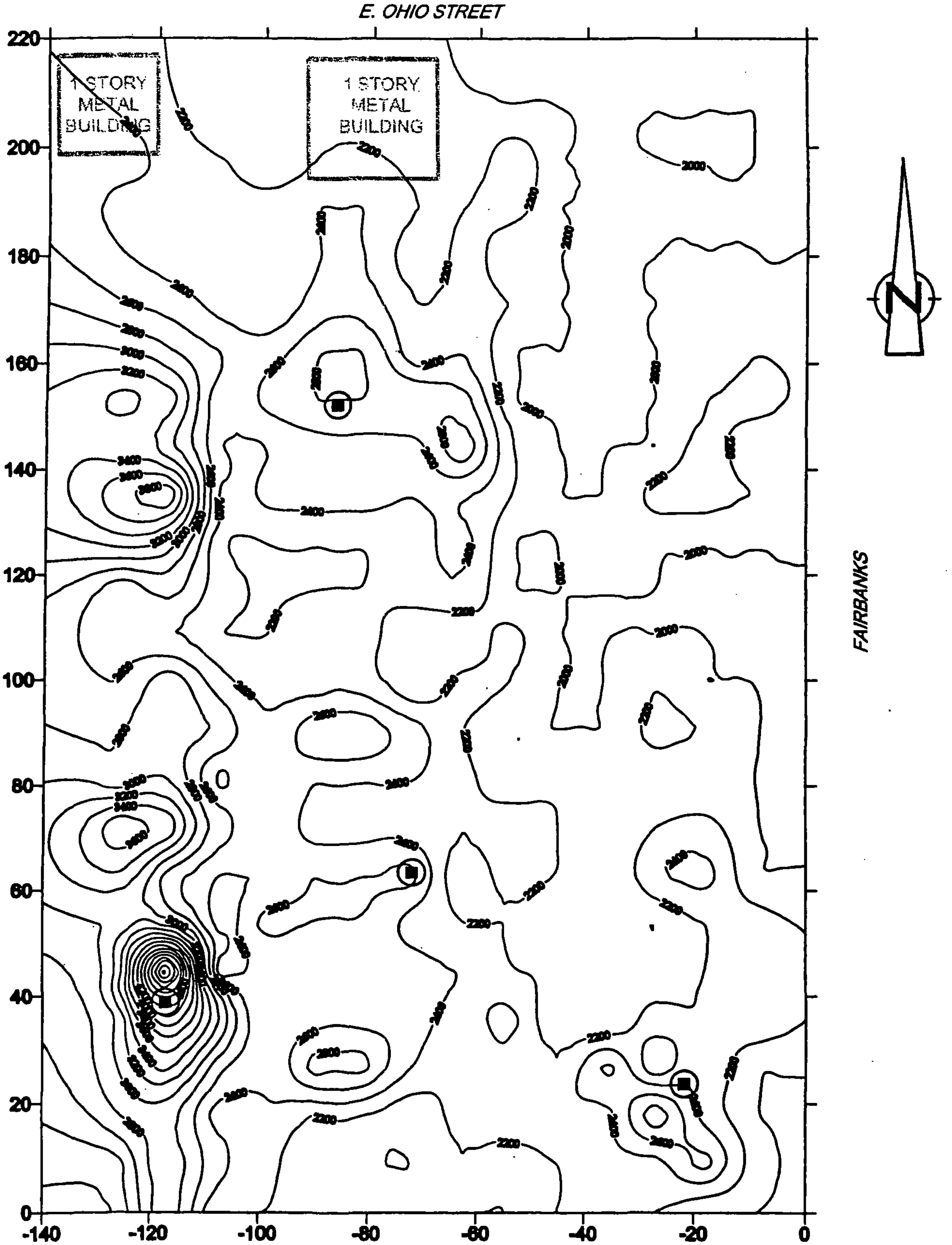
c.c.: Mary Fulgham - United States Environmental Protection Agency (USEPA)
Mike Ohm, Bell, Boyd & Lloyd
Carl Peterson, Draper & Kramer
Thomas Carey, Bell, Boyd & Lloyd
Wilson P. Funkhouser, Funkhouser Vegosen Liebman & Dunn Ltd.
Walter Pochron, CRA

TABLE

SURFICIAL RADIATION SURVEY RESULTS
REAL PROPERTY LOCATED AT FAIRBANKS OHIO
CHICAGO, ILLINOIS

		E-9	E-18	E-27	E-36	E-45	E-54	E-63	E-72	E-81	E-90	E-99	E-108	E-117	E-126
	SE Corner	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	0		2000[1]	2200	2300	2200	2000	2000	2000	2200	2200	2200	2200	3000	2200
N--9	A	2100	2700	2300	2300	2200	2000	2200	2000	2000	2000	2300	2500	3000	2300
N-18	B	2000	2300	3000	2300	2400	2400	2300	2000	2200	2200	2400	2300	2900	2800
N-27	C	2000	2400	2000	2700	2200	2400	2200	2400	2900	2900	2400	2700	3500	3000
N-36	D	2400	2200	2300	2000	2000	2500	2300	2500	2500	2500	2400	3300	4200*	3000
N-45	E	2400	2200	2000	2200	2200	2200	2400	2500	2400	2400	2500	2300	5900	3200
N-54	F	2300	2200	2000	2000	2000	2200	2200	2300	2600	2600	2700	2300	3000	3000
N-63	G	2000	2500	2400	2000	2200	2300	2000	2700	2600	2600	2400	2400	2700	3400
N-72	H	2000	2300	2200	2000	2200	2400	2200	2300	2300	2300	2600	2700	3600	3800
N-81	I	2000	2000	2000	2200	2200	2000	2300	2400	2400	2400	2600	2300	3000	2800
N-90	J	2000	2200	2300	2000	2000	2000	2200	2500	2800	2800	2400	2800	2900	2800
N-99	K	2000	2000	2200	2000	2000	2200	2300	2000	2300	2300	2300	2500	3000	2600
N-108	L	2000	2000	2000	2000	2000	2300	2000	2000	2300	2300	2200	2200	2400	2500
N-117	M	2000	2000	2000	2000	2000	2000	2400	2300	2200	2200	2200	2300	2700	2400
N-126	N	2000	2000	2000	2200	2000	2000	2500	2300	2200	2200	2200	2200	3100	3300
N-135	O	2200	2300	2300	2000	2000	2200	2400	2400	2500	2500	2500	2300	4000	3800
N-144	P	2000	2300	2000	2000	2000	2200	3000	2500	2500	2500	2400	2400	3000	3200
N-153	Q	2300	2200	2000	2000	2000	2000	2700	2800	2800	2800	2700	2400	3300	3500
N-162	R	2200	2000	2000	2000	2000	2000	2400	2200	2800	2800	2500	2600	2800	3000
N-171	S	2000	2200	2000	2000	2000	2200	2300	2200	2500	2500	2200	2300	2500	2600
N-180	T	2000	2000	2000	2000	2000	2000	2300	2000	2400	2400	2300	2300	2300	2400
N-189	W	2000	2000	2000	2000	2000	2300	2200	2200	2400	2400	2300	2300	2400	2300
N-198	X	2000	2000	2000	2000	2000	2400	2000	BLD[1]	BLD	BLD	2000	2200	2300	2500
N-207	Y	2000	2000	2000	2000	2000	2000		BLD	BLD	BLD	2200	2000	BLD	BLD

[1]BLD = Building
*Reading of 8500 cpm five feet to the north
Readings in counts per minute (cpm)
Background approximately 2,000 cpm



NOTE:

2,000 COUNTS PER MINUTE

BUILDING LOCATIONS ARE APPROXIMATE

APPROXIMATE SOIL BORING LOCATION

figure 1

SURFICIAL RADIATION SURVEY CONTOURS
REAL PROPERTY LOCATED AT FAIRBANKS & OHIO
Chicago, Illinois

17770-00(SOURCE)GN-CO001 FEB 28/2001

ATTACHMENT A

SOIL BORING STRATIGRAPHIC LOGS

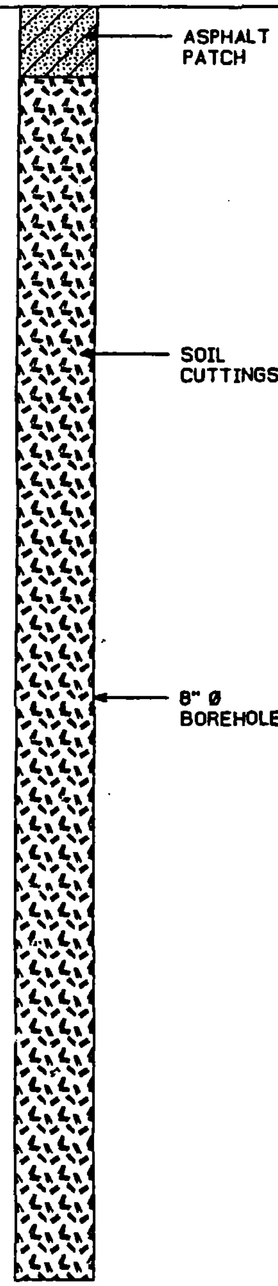
STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(CL-01)
Page 1 of 1

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: FAIRBANKS & OHIO
LOCATION: CHICAGO, ILLINOIS
DRILLING CONTRACTOR: MID AMERICA DRILLING

HOLE DESIGNATION: SB-B3
DATE COMPLETED: FEBRUARY 9, 2001
DRILLING METHOD: 4 1/4" HSA
CRA SUPERVISOR: W. POCHRON
DRILLER:

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	STATE	'N' VALUE	PID (ppm)
	Asphalt & Gravel		ASPHALT PATCH				
	Fill Sand & Gravel, black, moist						
	CL-CLAY, some sand, little gravel, trace of bricks, dark brown, moist (FILL)			1SS			1
2.5	- brick fragments		SOIL CUTTINGS				
	SP-SAND, some clay, little gravel and brick fragments, dark brown to gray, wet, (FILL)			2SS			
5.0							
	SP-SAND, fine to medium grained, little gravel, brown, moist		8" Ø BOREHOLE	3SS			
7.5				4SS			
				5SS			
	END OF HOLE @ 11.0ft BGS						



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

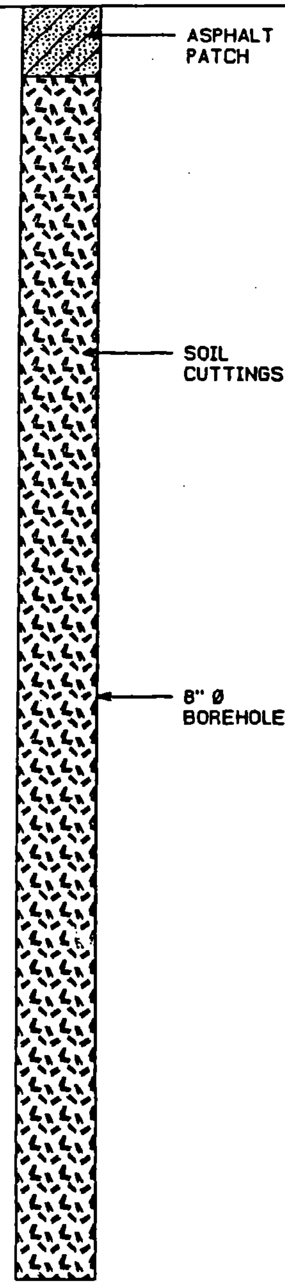
STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(CL-02)
Page 1 of 1

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: FAIRBANKS & OHIO
LOCATION: CHICAGO, ILLINOIS
DRILLING CONTRACTOR: MID AMERICA DRILLING

HOLE DESIGNATION: SB-G8
DATE COMPLETED: FEBRUARY 9, 2001
DRILLING METHOD: 4 1/4" HSA
CRA SUPERVISOR: W. POCHRON
DRILLER:

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	Asphalt & Gravel						
	SP-SAND, little gravel, trace of silt and bricks, glass, brown, dry, (FILL)			1SS			
2.5							
	- little clay, dark brown			2SS			
5.0	- bricks, and rubble						
				3SS			
7.5				4SS			
	SP-SAND, medium to fine grained, gray, moist			5SS			
	END OF HOLE @ 11.0ft BGS						



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

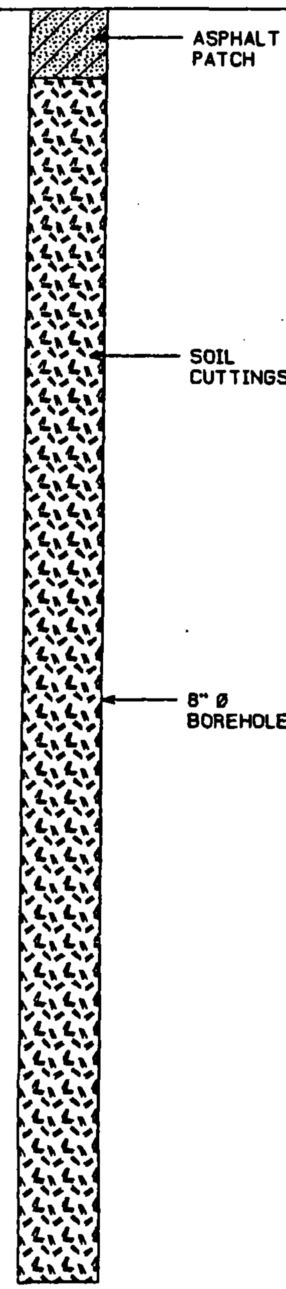
STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(CL-03)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: FAIRBANKS & OHIO
LOCATION: CHICAGO, ILLINOIS
DRILLING CONTRACTOR: MID AMERICA DRILLING

HOLE DESIGNATION: SB-D-13 1/2
DATE COMPLETED: FEBRUARY 9, 2001
DRILLING METHOD: 4 1/4" HSA
CRA SUPERVISOR: W. POCHRON
DRILLER:

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	Asphalt & Gravel						
	Gravel & Rubble FILL						
	SP-SAND, little clay, gravel, bricks, fragments, dark brown, (FILL)			1SS			
2.5							
	SP-SAND, light to medium gray, fine grained, metallic color, (FILL)			2SS			
5.0				3SS			
	END OF HOLE @ 7.0ft BGS						
7.5							



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ⊻ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

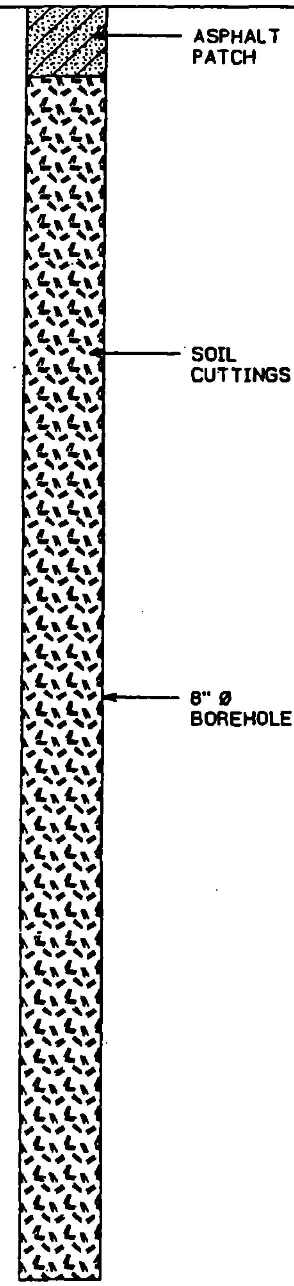
STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

(CL-04)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: FAIRBANKS & OHIO
LOCATION: CHICAGO, ILLINOIS
DRILLING CONTRACTOR: MID AMERICA DRILLING

HOLE DESIGNATION: SB-Q10
DATE COMPLETED: FEBRUARY 9, 2001
DRILLING METHOD: 4 1/4" HSA
CRA SUPERVISOR: W. POCHRON
DRILLER:

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	Asphalt & Gravel						
	SP-SAND, little gravel, brick fragments, trace of clay, gray, dry, (FILL) - rubble			1SS			
2.5	SP-SAND, little clay, gravel, brick fragments, glass, dark brown, moist, (FILL)			2SS			
5.0				3SS			
	- rubble (1 foot)						
7.5				4SS			
	SP-SAND, fine to medium grained, light gray, moist			5SS			
	END OF HOLE @ 11.0ft BGS						



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND
STATIC WATER LEVEL
CHEMICAL ANALYSIS

ATTACHMENT B

RSSI REPORT

REPORT OF SURVEY ACTIVITIES
PERFORMED AT 247 E. OHIO STREET
CHICAGO, ILLINOIS

PERFORMED FOR

CONESTOGA-ROVERS & ASSOCIATES
8615 W. BRYN MAWR AVENUE
CHICAGO, IL 60631-3501

BY

RSSI
6312 W. OAKTON STREET
MORTON GROVE, ILLINOIS 60053-2723

February 19, 2001

400001\crs\conestoga02.doc

I. INTRODUCTION

During the early 20th century, radioactive material was used in industrial operations between Illinois Street and Grand Avenue east of Michigan Avenue. Use of this material led to known soil contamination in areas near the subject site. Because of concerns of possible contamination, a survey was performed at 247 E. Ohio Street in Chicago on February 9, 2001 to determine whether the site was contaminated with residual radioactive material. The US Environmental Protection Agency (EPA) has an action level of 5 pCi/g of Ra-226 and Ra-228 activity above background concentrations, which are assumed to be 2.1 pCi/g.

II. METHODOLOGY

The survey area was an asphalt-covered parking lot with three small buildings located at the edges of the lot. Above-ground radiation level measurements were performed by passing a side shielded 2 inch by 2 inch thallium doped sodium iodide (NaI(Tl)) detector over the survey area. The detector was positioned about 3 inches from the ground surface during the survey. The detector was connected to a Ludlum 193 ratemeter (serial number 149080.) Measurements were recorded in the intersection of every approximate nine foot grid node. An RSSI employee took measurements and a Conestoga-Rovers & Associates (CRA) employee recorded the data.

Down hole survey measurements were performed in two locations by placing a 1-inch by 1-inch NaI(Tl) detector connected to a Ludlum 2241 scaler (serial number 116442) in boreholes, bored by a CRA contractor, at one foot intervals to an eleven foot depth.

Three soil samples were collected from one borehole for gamma spectroscopy using a high purity germanium (HPGe) detector. The borehole was located in the area where the highest surface measurement was observed. One sample was analyzed (the sample from 1 to 3 foot depths) because it was the sample least likely to be homogenized.

III. RESULTS

The background radiation level with the Ludlum 193 and the 2-inch by 2-inch sodium iodide detector was 2,000 counts per minute (cpm). The survey results are shown on the attached Table 1 compiled by CRA. Several areas on the site had radiation levels significantly above background. The most elevated areas were along the western edge of the property. The highest reading was 8,500 cpm, measured between areas D13 and E13. The measurement was approximately 41 feet from the south sidewalk and approximately 19 feet from the brick wall.

Down hole measurements were made with the 1-inch by 1-inch detector and the Ludlum 2241 at two different locations, B3 and G8. The results of these measurements are summarized in Table 2. Borehole G8 readings could not be made at the surface and one and two foot depths because the equipment malfunctioned due to the heavy rain.

Table 2 Down Hole Measurement Results

Depth	Hole B3 (cts in 1 min)	Hole G8 (cts in 1 min)
surface	1565	-
1 ft	4019	-
2 ft	4576	-
3 ft	3504	3948
4 ft	3487	3484
5 ft	2418	2523
6 ft	2070	2421
7 ft	1946	2285
8 ft	2020	1769
9 ft	1924	1692
10 ft	1513	1633
11 ft	1667	1599

Gamma spectroscopy was performed on one soil sample taken from the area with the highest surface reading. The Final Activity Report for the analysis is attached. The sample was counted for one hour and analyzed for the naturally occurring thorium, uranium, and actinium series and potassium-40. Actinium-228 is used as a surrogate for Radium-228 in the thorium series. Lead-214 is used as a surrogate for Radium-226 in the uranium series. The concentration of Ac-228 and Pb-214 are equal or approaching the concentrations of Radium-228 and Radium-226 in the soil depending upon equilibrium. The results of the gamma spectroscopy analysis are summarized below in Table 3.

Table 3 Gamma Spectroscopy Results

Sample Location (RSSI ID Number)	Ac-228 (pCi/g)	Pb-214 (pCi/g)	Total (pCi/g)
D13 (010359)	433	152	585

IV. CONCLUSIONS

The results of the surface survey show evidence of concentrations of radioactivity above normal background levels at a number of locations. The down hole measurements were elevated above levels usually attributed to naturally occurring radioactive material or rubble in the soil. Moreover, the gamma spectroscopy results show concentrations of radium-226 and radium-228 surrogates in excess of the EPA's action level of 7.1 pCi/g.

```
===========================================================================
            RSSI High Resolution Gamma Spectroscopy Analysis
===========================================================================
                          Quantum Technology
                         GDR_C   Version 6.0
===========================================================================

Sample ID :   D-13 010359

---------------------------------------------------------------------------
Sample Size . . . . . . . . 5.93e+002 g | Spectrum File . . h:\pcaspec\010359.spm
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . . .  00-00-00 00:00
Sampling Stop . . . . .00-00-00 00:00 | Live Time . . . . . . . . . .   2229 Sec
Current Date. . . . . .00-00-00 00:00 | Real Time . . . . . . . . . .      0 Sec
---------------------------------------------------------------------------
                          Detector #:  0
Energy(keV)=  0.00 +  0.250*Ch + 0.00e+000*Ch^2 + 0.00e+000*Ch^3 00-00-00 00:00

FWHM(keV)  =  2.00 +  0.000*En + 0.00e+000*En^2 + 0.00e+000*En^3 00-00-00 00:00
                Where En = Sqrt(Energy in keV)
---------------------------------------------------------------------------
Sensitivity . . . . . . . . . . . 2.00 | Search Start / End. . . . .   0 / 8191
Sigma Multiplier. . . . . . . . . 1.00 |
---------------------------------------------------------------------------


===========================================================================
            RSSI High Resolution Gamma Spectroscopy Analysis
===========================================================================
                          Quantum Technology
                  GDR_C Nuclide Activity Summary
===========================================================================

Sample ID: D-13 010359

---------------------------------------------------------------------------
Sample Size . . . . . . . . 5.93e+002 g | Spectrum File . . h:\pcaspec\010359.spm
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . . .  00-00-00 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF]. . . . . 0.00e+000 Hrs
---------------------------------------------------------------------------
Efficiency File.h:\gdr\eff\500mar.eff | Library File. . . h:\gdr\lib\UThAcK.lib
ID. . . . . . . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K
---------------------------------------------------------------------------
Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]      02-01-01 12:00
---------------------------------------------------------------------------
Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.00
---------------------------------------------------------------------------
---------------------------------------------------------------------------

                        FINAL ACTIVITY REPORT

             Energy      Conc +- 1.00sigma      Halflife      Peaks
Nuclide       (keV)      (uCi/g            )      (hrs)       Found
===========================================================================
Fr-223     Average:    5.27e-004 +-6.72e-006 3.63e-001     2 of   5
```

	79.80	5.68e-004	+-7.10e-006		
	88.47	1.83e-004	+-2.08e-005		
Pa-231	Average:	9.27e-004	+-1.26e-005	2.87e+008	2 of 5
	90.88	8.15e-005	+-3.22e-005		
	302.67	1.08e-003	+-1.37e-005		
Pb-212	77.11	2.17e-004	+-2.89e-006	1.06e+001	1 of 5
Pb-214	Average:	2.60e-004	+-2.77e-006	4.47e-001	2 of 6
	77.11	3.73e-004	+-4.98e-006		
	241.98	2.10e-004	+-3.33e-006		
Tl-208	Average:	6.87e-005	+-2.07e-006	5.09e-002	2 of 5
	277.35	1.94e-004	+-4.76e-006		
	860.37	3.93e-005	+-2.30e-006		
Th-228	215.98	5.56e-003	+-1.44e-004	1.68e+004	1 of 2
Pa-234	Average:	6.90e-005	+-1.34e-006	6.70e+000	3 of 14
	94.66	2.16e-005	+-2.97e-006		
	131.20	4.18e-005	+-1.82e-006		
	880.51	1.68e-004	+-2.69e-006		
Ra-224	240.98	3.98e-004	+-6.32e-006	8.69e+001	1 of 1
Tl-210	Average:	2.38e-006	+-2.36e-007	2.17e-002	2 of 3
	799.70	2.21e-006	+-2.40e-007		
	1310.00	7.85e-006	+-1.36e-006		
Bi-214	Average:	5.26e-005	+-1.89e-006	3.32e-001	2 of 7
	934.06	3.79e-003	+-2.03e-005		
	1120.30	2.00e-005	+-1.90e-006		
Po-210	803.10	5.30e-001	+-2.78e-002	3.32e+003	1 of 1
Po-216	804.90	3.24e-001	+-1.70e-002	4.06e-005	1 of 1
TOTAL:		8.61e-001 uCi/g			

APPENDIX C

CRA REPORT OF SUBSURFACE INVESTIGATION [APRIL 2001]

April 9, 2003 Reference No. 017770

DRAFT

Mr. Michael Ohm
Bell Boyd & Lloyd
Three First National Plaza
70 West Madison Street
Suite 3300
Chicago, Illinois 60602-4202

Mr. Wilson Funkhouser
Funkhouser Vegosen Liebman & Dunn Ltd.
Suite 2410
55 West Monroe Street
Chicago, Illinois 60603-5008Chicago, Illinois
Gentlemen:

Re: Subsurface Investigation
247 East Ohio
Chicago, Illinois

On behalf of Draper & Kramer, Inc. and D'Ancona & Company, Conestoga-Rovers & Associates (CRA) completed a limited Subsurface investigation at the property located at 247 East Ohio in Chicago, Illinois (Property). The purpose of the investigation was to evaluate the Property from the perspective of assessing subsurface radiation relative to naturally occurring background radiation levels in local unimpaired soils and to evaluate the potential volume of soil containing elevated radiation levels. The presence of soils containing elevated levels of radioactive thorium on the Property was confirmed during a previous investigation completed by CRA on February 9, 2001.

The Property is located near the Lindsay Light Superfund Site and Lindsay Light II Site where soils containing radioactive thorium have been previously reported. The primary objective of the limited Property investigation was to delineate radioactive thorium that exists above the cleanup level established by the United States Environmental Protection Agency (USEPA) for the neighboring Sites. The Property is currently an active pay parking lot located in the Streeterville area of Downtown Chicago. The Property is bounded by East Ohio Street to the north, Fairbanks Court to the east, East Grand Avenue to the south, and a high-rise condominium building to the west.

DRAFT

In brief, results from CRA's investigation suggest that the presence of radioactive thorium at levels above the cleanup level established by the USEPA may predominate in two areas located within the western third of the Property. The following discussion summarizes the activities completed during the investigation and presents the data obtained therefrom.

PREVIOUS INVESTIGATION

Field activities associated with the initial Property investigation were conducted on February 9, 2001. Investigative activities completed consisted of the following:

- completion of a surficial survey of the Property;
- installation and sampling of four soil borings at locations where elevated radiation levels were measured during the walkover survey;
- downhole measurement of radiation levels within the completed soil borings; and
- analysis of one soil sample using high-resolution gamma spectroscopy to identify and measure radiation levels.

Results from this investigation confirmed the presence of radioactive thorium in the soil at levels above the cleanup level established by the USEPA for the Lindsay Light Site.

SCOPE OF WORK

Field activities associated with the supplemental Property investigation were conducted during the week of April 16, 2001. Investigative activities completed consisted of the following:

- installation and sampling of 59 soil borings at locations where elevated radiation levels were observed during the walkover survey and at subsurface areas anticipated to be disturbed by Draper & Kramer's development of the Site;
- downhole measurement of radiation levels within the completed soil borings;
- analysis of 94 soil samples using high-resolution gamma spectroscopy to identify and measure radiation levels; and
- surveying of the completed soil boring locations.

DRAFT

RSSI of Morton Grove, Illinois was retained by CRA to provide downhole radiation measurements and sample analyses during the Property investigation. Mid-America Drilling Services, Inc. of Elburn, Illinois was retained by CRA to provide drilling services. Bollinger, Lach & Associates, Inc. of Oak Brook, Illinois was retained by CRA to provide surveying services.

Soil Borings

A total of 59 soil borings (SB-1 through SB-59) were advanced to measure radiation levels along the vertical profile of the open borehole. Soil boring maximum depths ranged from 11 to 13 feet below ground surface (bgs). Soils borings were advanced using a rotary drill rig equipped with 4 1/4-inch inside diameter hollow stem augers (HSA). Continuous split-spoon samples were collected during borehole advancement. Collected soil samples were inspected by a CRA geologist and described in accordance with the Unified Soil Classification System (USCS). Soil samples were retained in resealable plastic bags for possible analysis. Soil boring stratigraphic logs are provided in Attachment A.

Figure 1 illustrates the locations of the supplemental investigation soil borings completed during April along with the February initial investigation soil borings. This figure also illustrates estimated approximate locations of subsurface areas anticipated to be disturbed by Draper & Kramer's development of the Site[1] (basement structures and caissons/building footings indicated by the figure provided previously to CRA by Bell, Boyd & Lloyd LLC).

Borehole Logging

Upon completion of the soil boring, a section of 3-inch diameter polyvinyl chloride (PVC) well casing was lowered into the borehole and the HSAs were retracted, leaving the PVC casing in place. An RSSI Health Physicist then measured radiation levels at 1-foot intervals within the casing. Borehole radiation measurements were taken using a 2" x 2" sodium iodide detector attached to a Ludlum Model 2241 survey meter. This equipment, as used, is capable of measuring radiation levels in the soil in an approximate 2 to 3-foot radius around the soil boring. Therefore, the presence of radioactive materials in soils located outside of this 2 to 3-foot radius would likely not be detected. Once the measurements were completed, the PVC casing was removed from the borehole and used at the next soil boring location. Boreholes were backfilled with soil cuttings and bentonite chips and then capped with an asphalt patch.

---

[1] Since surveyed drawings were unavailable from Draper & Kramer, CRA utilized a "best guess" approach to approximate development locations.

DRAFT

Results from the downhole radiation survey are provided in RSSI's report provided in Attachment B.

Soil Analysis

A total of 95 soil samples were retained for analyses from soil borings. Soil samples were analyzed by high resolution gamma spectroscopy using a high purity germanium (HPGe) detector. Soil samples were counted for 1 hour and analyzed for the thorium, uranium, and actinium series and potassium-40. Actinium-228 (Ac-228) is used as a surrogate for radium-228 (Ra-228) in the thorium series. Lead 214 (Pb-214) is used as a surrogate for radium-226 (Ra-226) in the uranium series. The concentration of Ac-228 and Pb-214 are equal or approaching the concentrations of Ra-228 and Ra-226 in the soil. The USEPA has relied upon a soil radium standard for uranium and thorium sites found in Part 40, Title 192 of the Code of Federal Regulations (40 CFR 192). This standard is 5 picocuries per gram (pCi/g) of total radium (radium-226 plus radium-228) over background. The USEPA set the background radium level in the area at 2.1 pCi/g. Therefore the USEPA cleanup level is 5 pCi/g plus 2.1 pCi/g or 7.1 pCi/g at the neighboring Sites.

Surveying

The locations of the completed soil boring were surveyed with respect to vertical and horizontal control. Soil boring survey measurements were referenced to the coordinate system used on the Plat of Survey drawing (National Survey Services, Inc. survey no. N-11759 dated February 10, 1993) provided to CRA by Draper & Kramer on January 30, 2001.

INVESTIGATION RESULTS

Site Stratigraphy

Descriptions of the soil stratigraphy beneath the Property are provided on the stratigraphic logs provided in Attachment A. In general, two main stratigraphic units were encountered within the upper 13 feet of soil beneath the Property. The first unit consists of fill material that was encountered in all of the soil borings. The fill material consists mainly of silt, sand, and clay with varying amounts of gravel. In addition, the fill material also contain varying amounts of rubble consisting of brick fragments, concrete and minor amounts of slag, coal, glass, and wood. Significant amounts of brick and concrete rubble were encountered in numerous soil borings and resulted in poor to no sample recovery in the split-spoon samples collected from these

DRAFT

intervals. This poor sample recovery may have affected the analytical results (i.e., provided a low bias in affected samples) from samples collected from these intervals. Fill material was encountered just below the asphalt/gravel cover layer and extended to depths ranging from approximately 7.5 to 10.8 feet below ground surface (bgs). At soil boring SB-11, a 3 to 5-inch thick layer of fine-grained silver/gray sand was encountered. This sand exhibited high radiation levels and is believed to possibly be thorium tailings.

The fill material was underlain by native sand. The sand consisted mainly of fine-grained dense sand that was tan or gray in color. However, sand containing varying amounts of medium and coarse sand grains was also encountered across the Property.

Groundwater was not encountered in any of the soil borings.

Downhole Measurements

As discussed previously, RSSI measured downhole radiation levels at 1-foot intervals within the soil borings. Downhole radiation level measurements are summarized in RSSI's report provided in Attachment B. Downhole radiation measurements ranged from 5,645 counts per minute (CPM) from the 8-foot interval of SB-28 to 2,239,317 CPM from the 2 foot interval of SB-11. Figures 2 through 12 summarize and illustrate isopleth contours for the downhole measurements recorded from the 1 through 11-foot bgs intervals, respectively. In general, it appears that measurements between 5,000 and 12,000 CPM appear to represent native soils or fill materials with only trace amounts of rubble (i.e., background levels). Measurements between 12,000 and 40,000 CPM appear to represent fill material with increasing amounts of rubble or soil in close proximity to possible thorium-impacted soils or soil containing trace amounts of thorium impacted soils. Measurements of greater than 40,000 CPM are over four times background and are suggestive of soil that may contain radioactive materials in excess of 7.1 pCi/g.

As illustrated on Figures 2 through 12, there appear to be two areas along the western third of the Property where elevated measurements were recorded. The smaller of these two areas occurred at soil boring location SB-40. Radiation measurements above background were recorded at the 1, 2 and 3 foot bgs intervals, with the highest level of 162,798 CPM measured in the 2 foot bgs interval. The elevated radiation measurements in this area appear to be somewhat limited to the upper 3 feet of soil.

The second and larger area of elevated radiation measurements occurred at soil borings SB-4, SB-9, SB-11, SB-12, and SB-14. This area represents the same general area where soils containing

DRAFT

radioactive thorium at levels above the cleanup level established by the USEPA were observed during the February 2001 initial investigation. Elevated radiation measurements were recorded at the 1 through 8-foot bgs intervals, with the highest level of 2,239,317 CPM measured in the 2-foot bgs interval of SB-11. This interval corresponds with the soil boring location and interval where the seam of silver sand exhibiting elevated radiation reading was observed. The elevated radiation measurements in this area appear to extend all the way to the native sand encountered at depths of between approximately 7 and 9-feet bgs.

The depth at which elevated radiation measurements were recorded at the larger of the two areas (soil borings SB-4, SB-9, SB-11, SB-12, and SB-14) suggests that a depression in the ground may have been backfilled with soil/rubble containing thorium. Sanborn Maps from 1927 show several small buildings on the Property.

<u>Laboratory Results</u>

RSSI's analytical report for the samples analyzed is included in Attachment B. As discussed previously, the USEPA set the background radium level in the area at 2.1 pCi/g. Therefore the USEPA clean-up level is 5 pCi/g plus 2.1 pCi/g or 7.1 pCi/g.

Analytical results from RSSI are summarized on Table 1. Laboratory results indicate levels above 7.1 pCi/g in eight soil samples collected from six soil borings (SB-4, SB-9, SB-11, SB-12, SB-14, and SB-40). The highest radiation measurement of 2,500 pCi/g was recorded from the sample collected from the 1 to 3-foot bgs interval of SB-11. This soil sample contained the fine-grained silver sand encountered at a depth of 1.5-feet bgs in SB-11. Laboratory results from soil borings where poor sample recovery occurred due to the presence of rubble might not accurately represent actual in-situ soil radiation levels within these intervals. Therefore, laboratory results may have underestimated the actual number of locations where materials containing levels of thorium above 7.1 pCi/g are located.

<u>CONCLUSIONS</u>

Results from the limited investigation completed at the Property have confirmed the presence of radioactive materials in the soil in at least two areas along the western portion of the Property at levels above the cleanup level established by the USEPA.

Again, thank you for selecting CRA. If you have any questions, please call me at (773) 380-9933.

DRAFT

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Bruce Clegg

BCC/ko/1
Attachments

c.c.: Thomas Carey, Bell, Boyd & Lloyd
Alfred D'Ancona, III, Trustee, c/o D'Ancona & Company
Carl Peterson, Draper & Kramer
Walter Pochron, CRA

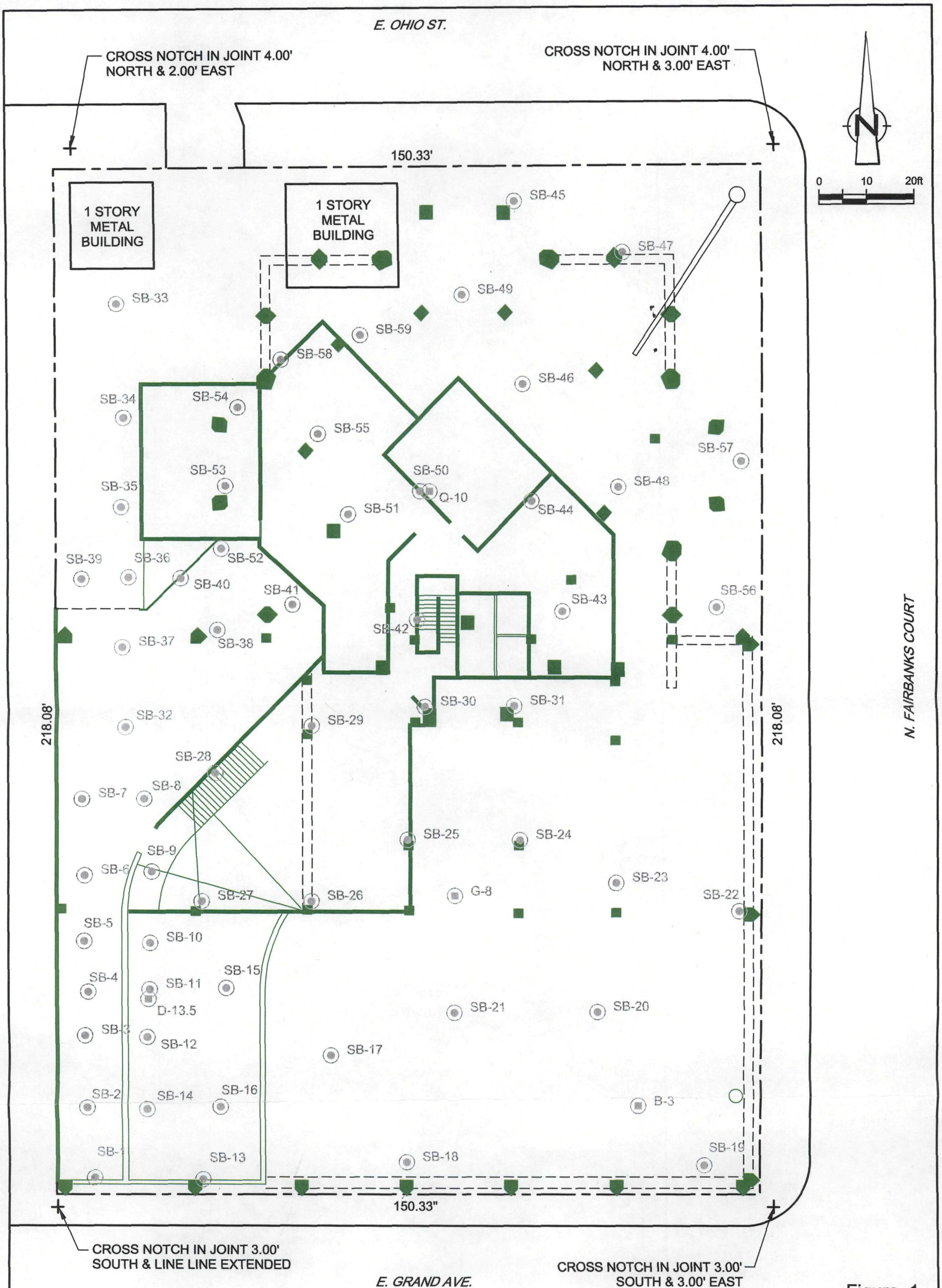


Figure 1

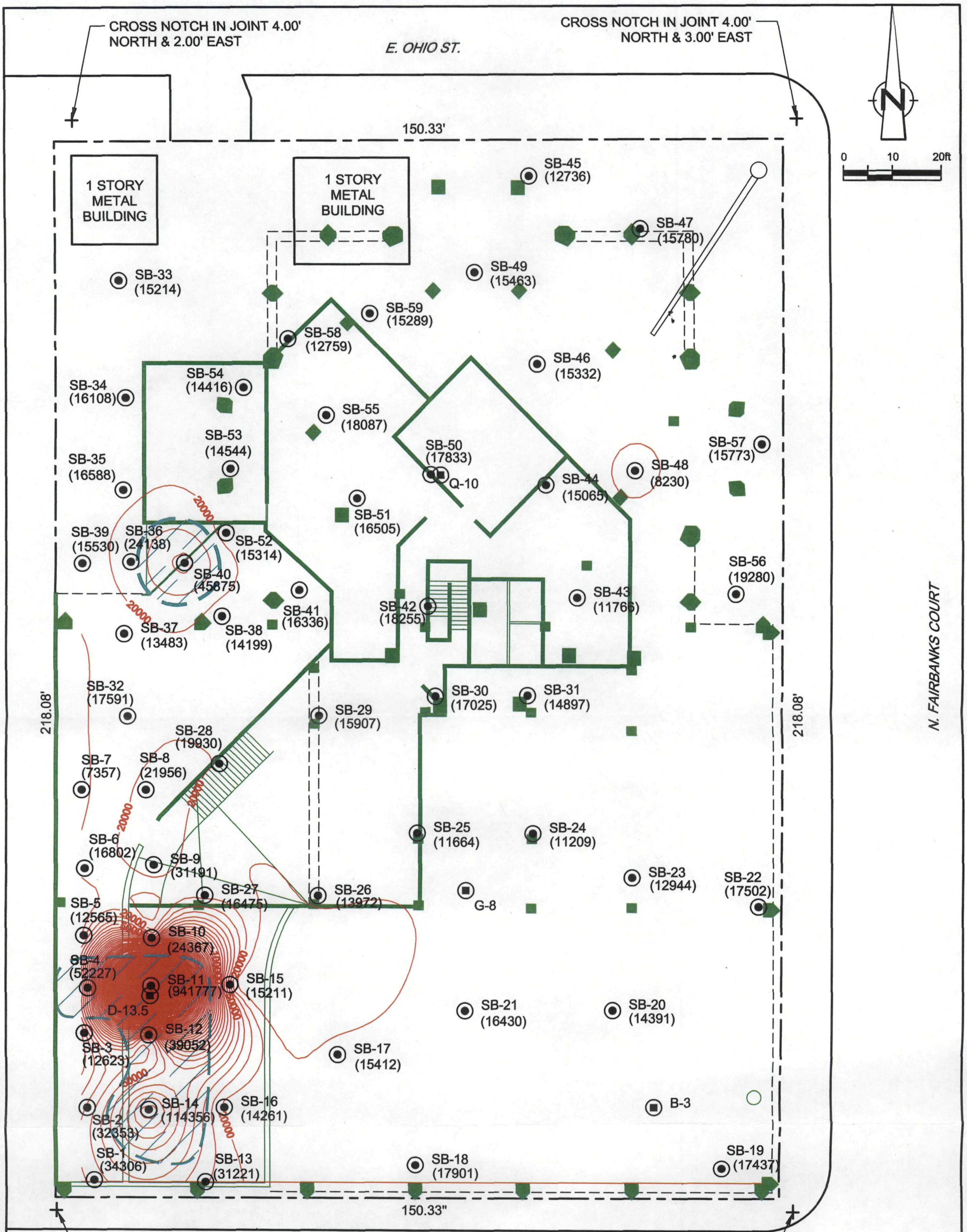
SOIL BORING LOCATIONS
FAIRBANKS AND OHIO
Chicago, Illinois

LEGEND

SB-13 — SUPPLEMENTAL SOIL BORING LOCATION AND IDENTIFIER

B-3 — INITIAL SOIL BORING LOCATION AND IDENTIFIER

17770-00(AppC002)GN-CO001 FEB 25/2004



LEGEND

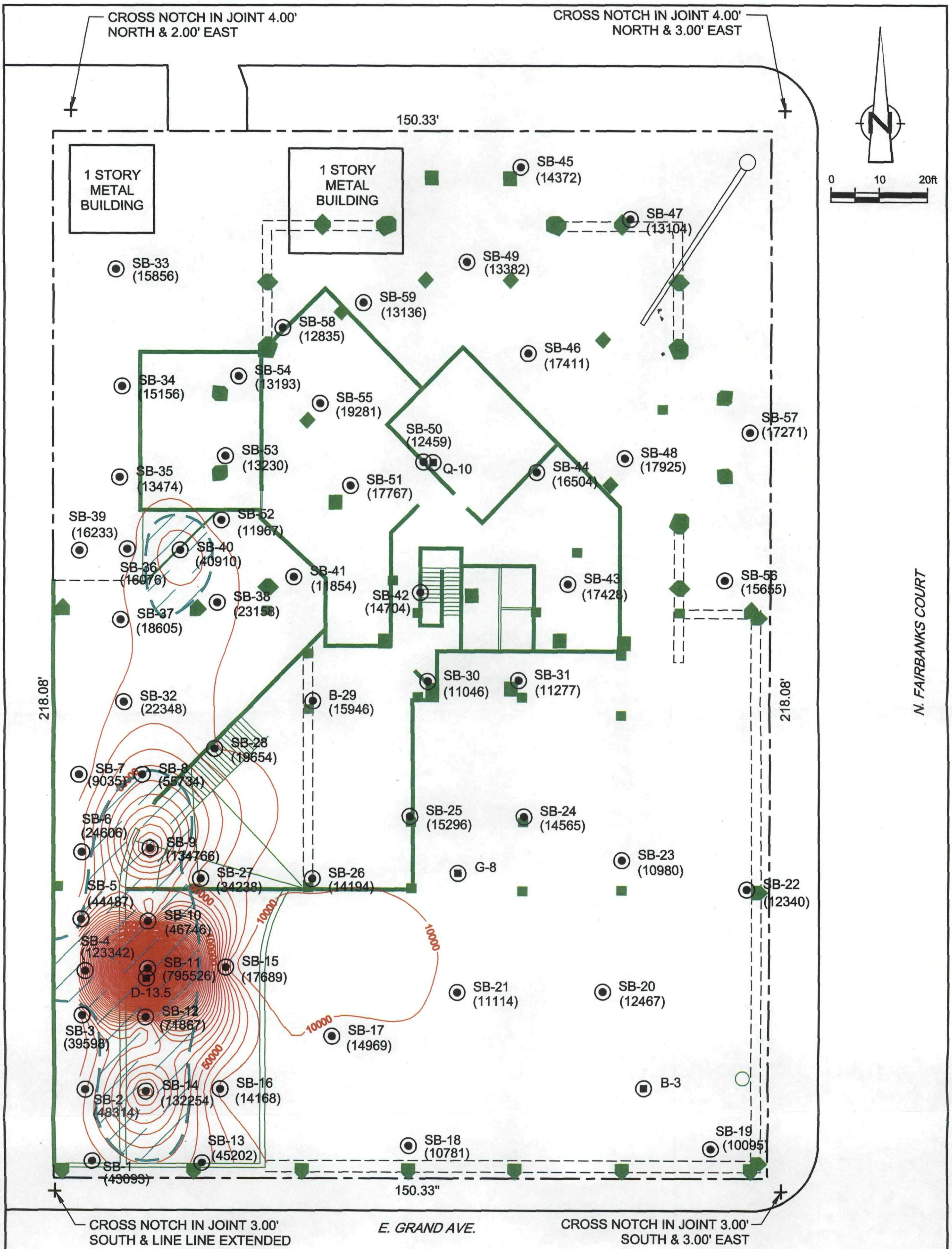
SB-13	SUPPLEMENTAL SOIL BORING LOCATION AND IDENTIFIER
(31221)	DOWN-HOLE READING IN COUNTS PER MINUTE
	AREA ASSUMED TO CONTAIN SOILS IN EXCESS OF USEPA CLEANUP OBJECTIVE
B-3	INITIAL SOIL BORING LOCATION AND IDENTIFIER

CRA

Figure 2

COUNTS PER MINUTE - ONE FOOT INTERVAL
SOIL BORING LOCATIONS
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(AppC002)GN-CO002 FEB 25/2004



LEGEND

B-13 ◉ SUPPLEMENTAL SOIL BORING LOCATION AND IDENTIFIER

(31221) DOWN-HOLE READING IN COUNTS PER MINUTE

AREA ASSUMED TO CONTAIN SOILS IN EXCESS OF USEPA CLEANUP OBJECTIVE

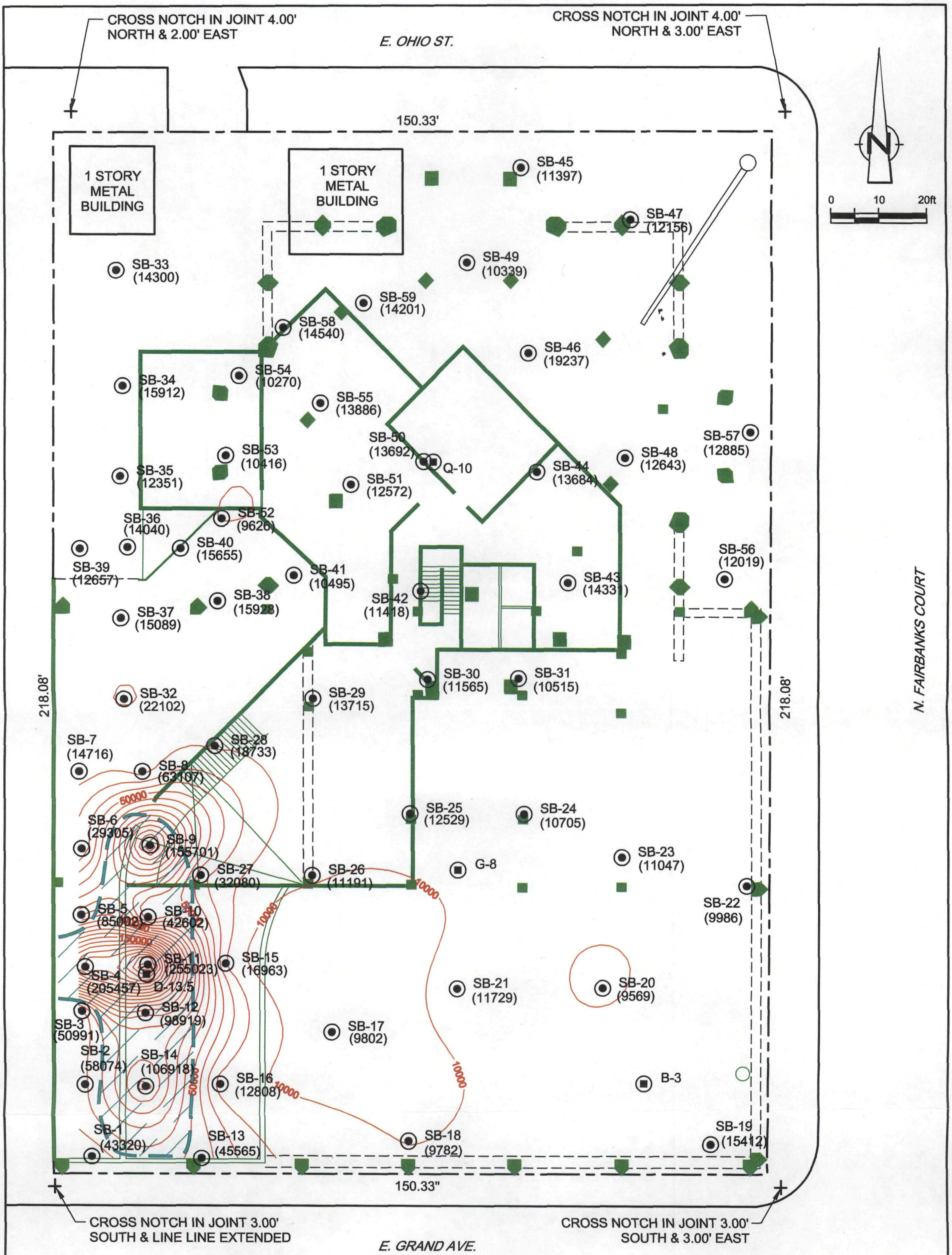
B-3 ▣ INITIAL SOIL BORING LOCATION AND IDENTIFIER

CRA

Figure 4

COUNTS PER MINUTE - THREE FOOT INTERVAL
SOIL BORING LOCATIONS
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(AppC002)GN-CO004 FEB 25/2004



LEGEND

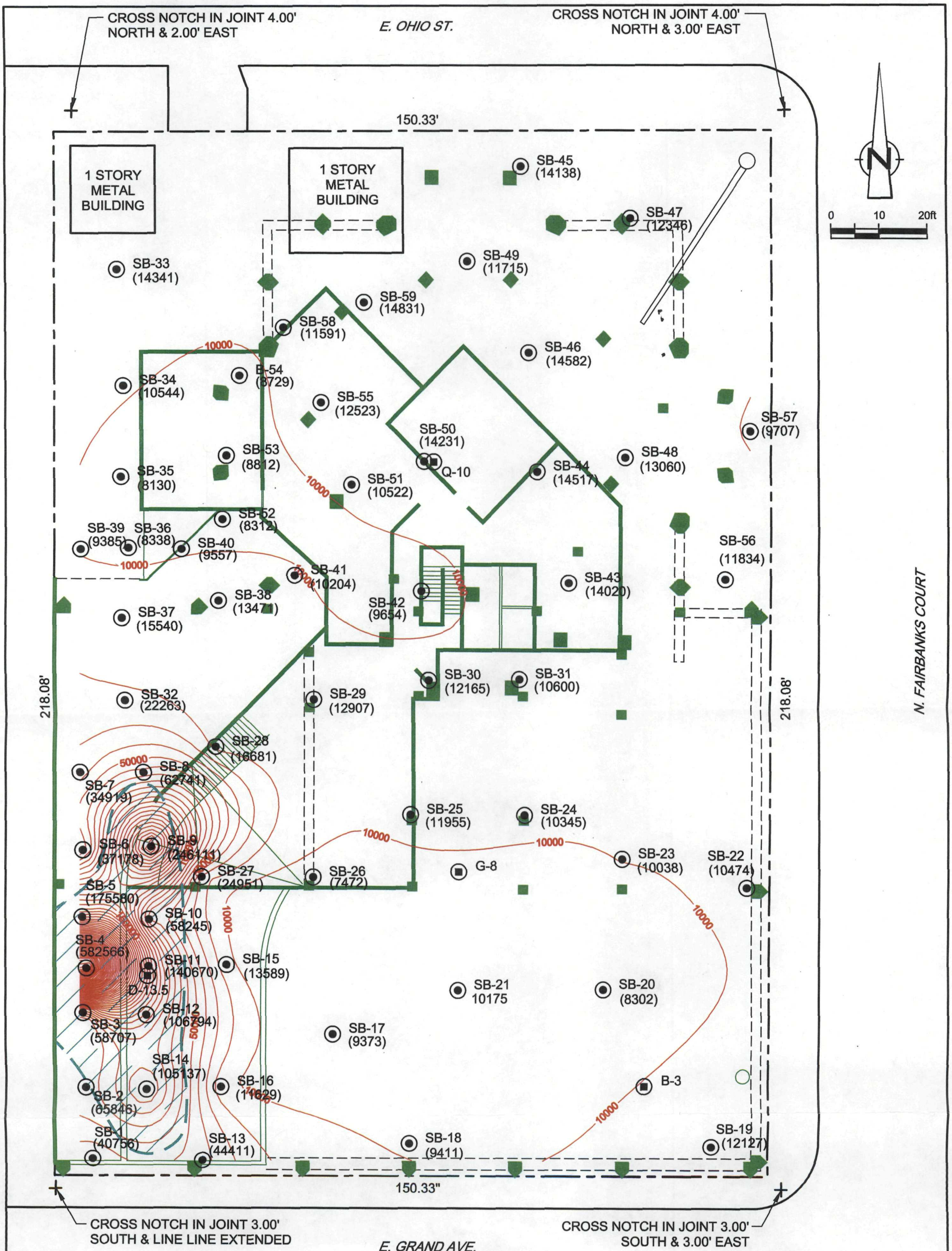
B-13	SUPPLEMENTAL SOIL BORING LOCATION AND IDENTIFIER	B-3	INITIAL SOIL BORING LOCATION AND IDENTIFIER
(31221)	DOWN-HOLE READING IN COUNTS PER MINUTE		
	AREA ASSUMED TO CONTAIN SOILS IN EXCESS OF USEPA CLEANUP OBJECTIVE		

CRA

Figure 5

COUNTS PER MINUTE - FOUR FOOT INTERVAL
SOIL BORING LOCATIONS
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(AppC002)GN-CO005 FEB 25/2004



LEGEND

B-13 SUPPLEMENTAL SOIL BORING LOCATION AND IDENTIFIER

(31221) DOWN-HOLE READING IN COUNTS PER MINUTE

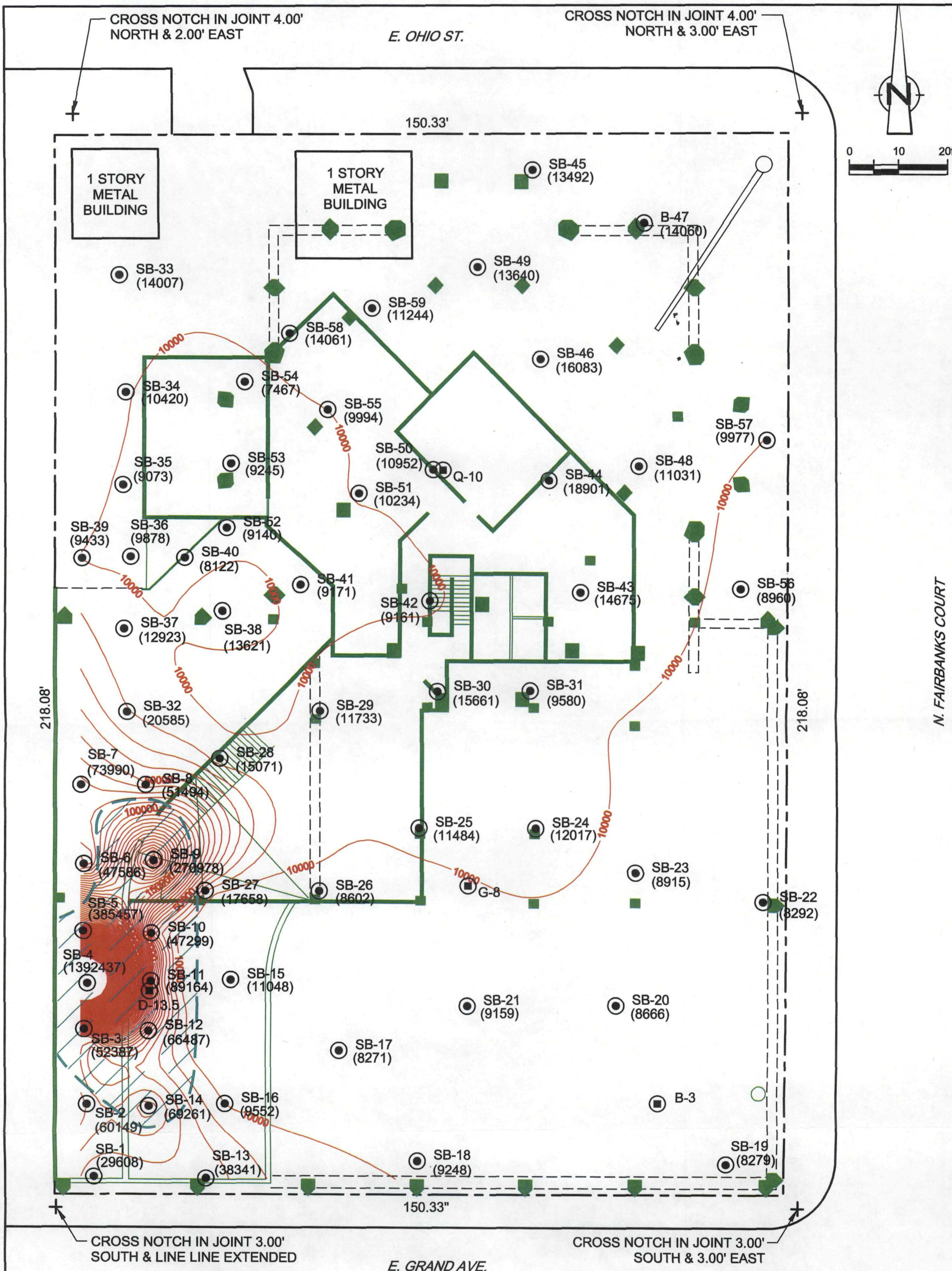
AREA ASSUMED TO CONTAIN SOILS IN EXCESS OF USEPA CLEANUP OBJECTIVE

B-3 INITIAL SOIL BORING LOCATION AND IDENTIFIER

Figure 6

COUNTS PER MINUTE - FIVE FOOT INTERVAL
SOIL BORING LOCATIONS
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(AppC002)GN-CO006 FEB 25/2004



LEGEND

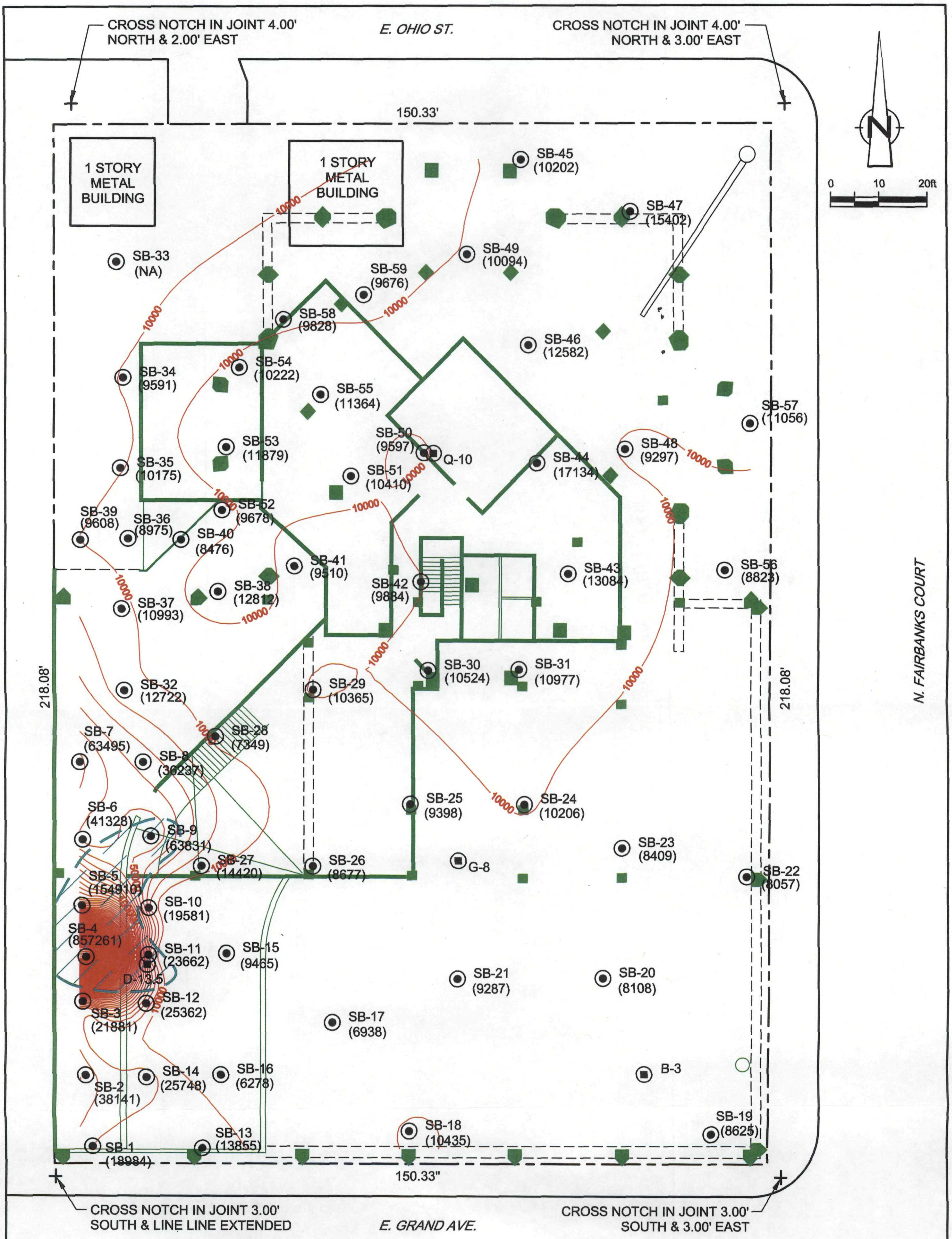
B-13 ⊙	SUPPLEMENTAL SOIL BORING LOCATION AND IDENTIFIER
B-3 ⊡	INITIAL BORING SOIL LOCATION ANDIDENTIFIER
(31221)	DOWN-HOLE READING IN COUNTS PER MINUTE
	AREA ASSUMED TO CONTAIN SOILS IN EXCESS OF USEPA CLEANUP OBJECTIVE

CRA

Figure 7

COUNTS PER MINUTE - SIX FOOT INTERVAL
SOIL BORING LOCATIONS
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(AppC002)GN-CO007 FEB 25/2004



LEGEND

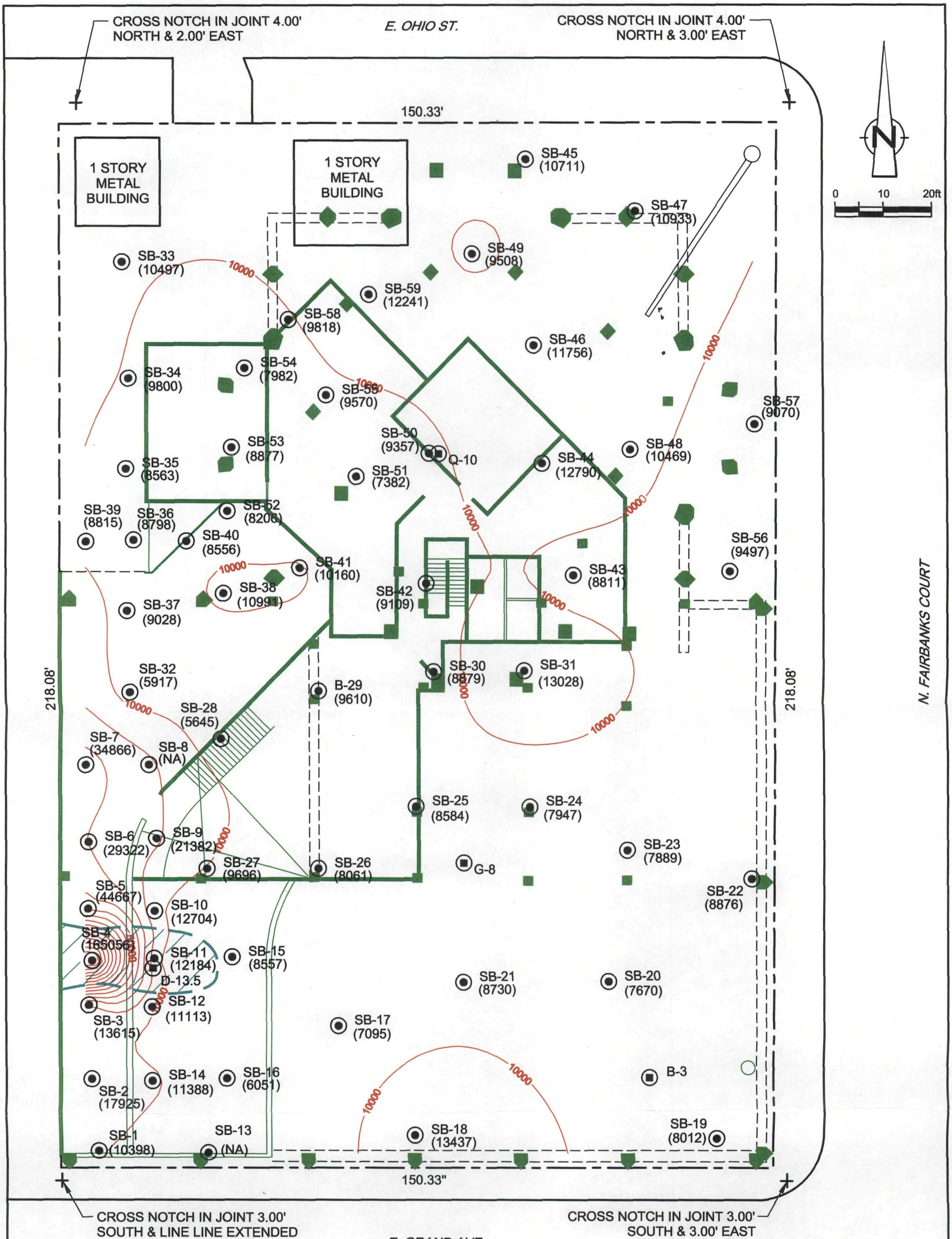
NA	NOT AVAILABLE RECORDING ERROR
B-13 ◉	SUPPLEMENTAL SOIL BORING LOCATION AND IDENTIFIER
(31221)	DOWN-HOLE READING IN COUNTS PER MINUTE
[hatched box]	AREA ASSUMED TO CONTAIN SOILS IN EXCESS OF USEPA CLEANUP OBJECTIVE
B-3 ◉	INITIAL SOIL BORING LOCATION AND IDENTIFIER

CBA

Figure 8

COUNTS PER MINUTE - SEVEN FOOT INTERVAL
SOIL BORING LOCATIONS
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(AppC002)GN-CO008 FEB 25/2004



LEGEND

NA	NOT AVAILABLE RECORDING ERROR
B-13 ⦿	SUPPLEMENTAL SOIL BORING LOCATION AND IDENTIFIER
(31221)	DOWN-HOLE READING IN COUNTS PER MINUTE
	AREA ASSUMED TO CONTAIN SOILS IN EXCESS OF USEPA CLEANUP OBJECTIVE
B-3 ⦿	INITIAL SOIL BORING LOCATION AND IDENTIFIER

CRA

Figure 9

COUNTS PER MINUTE - EIGHT FOOT INTERVAL
SOIL BORING LOCATIONS
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(AppC002)GN-CO009 FEB 25/2004

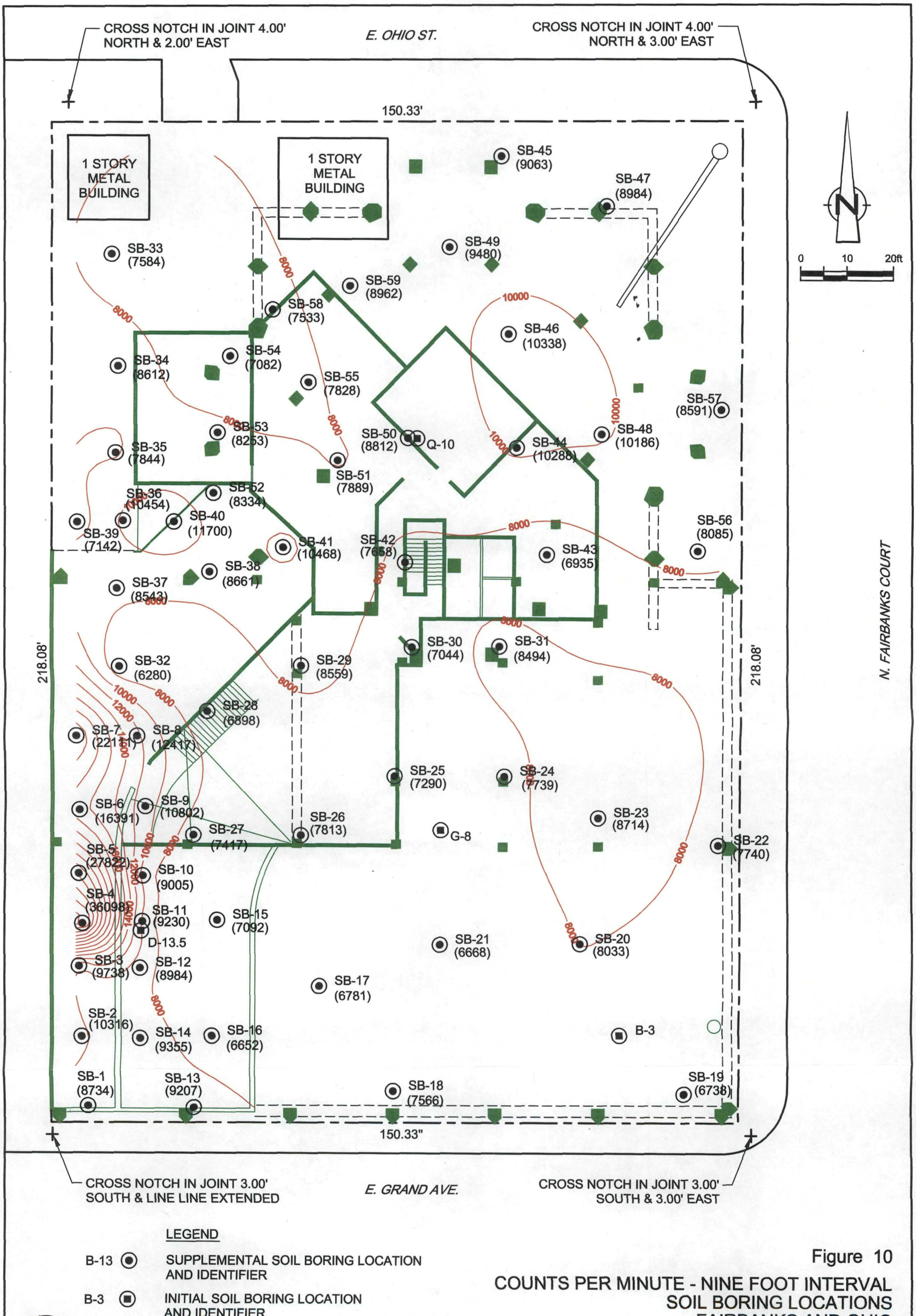
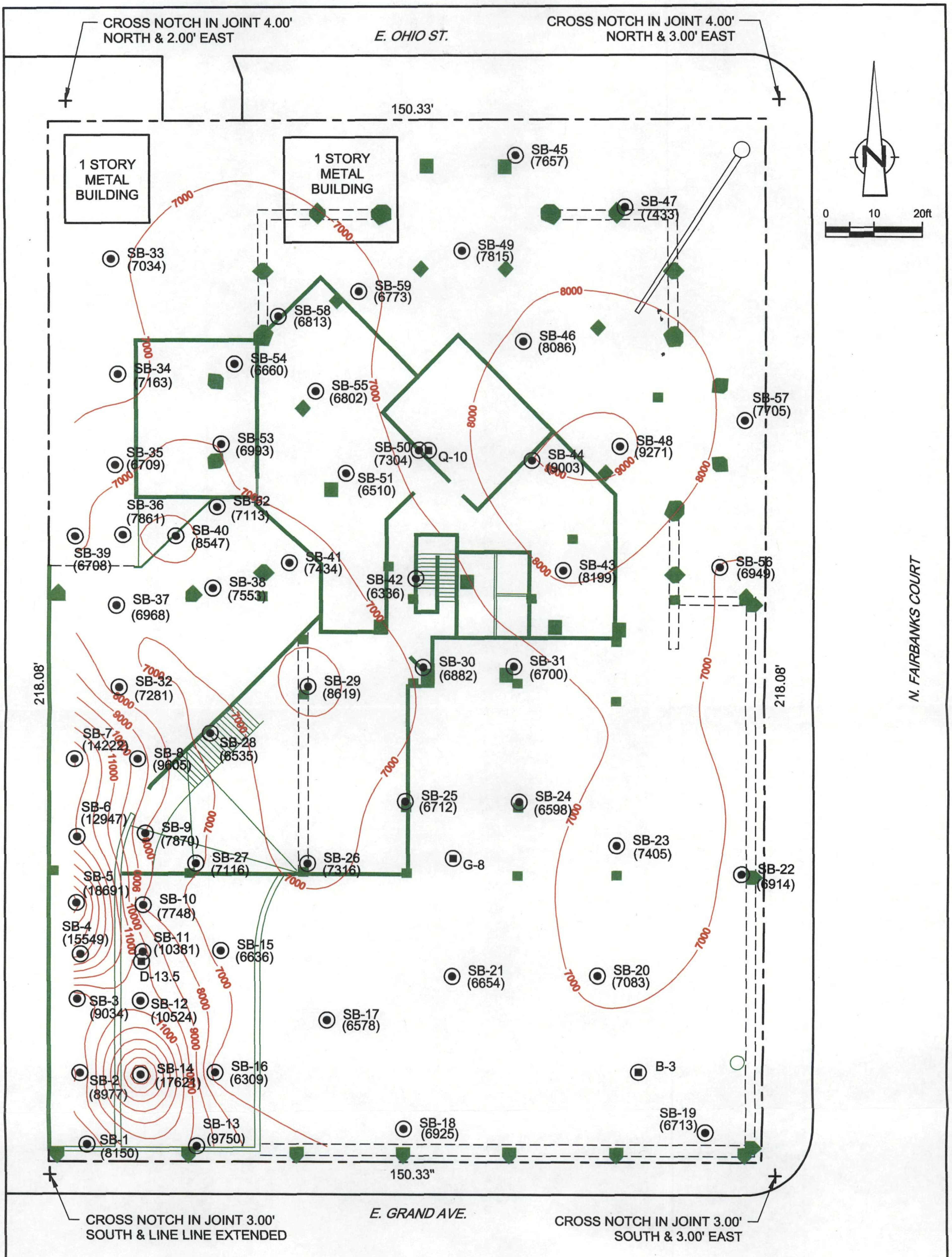


Figure 10

COUNTS PER MINUTE - NINE FOOT INTERVAL
SOIL BORING LOCATIONS
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(AppC002)GN-CO010 FEB 25/2004



LEGEND

B-13 ⦿ SUPPLEMENTAL SOIL BORING LOCATION AND IDENTIFIER

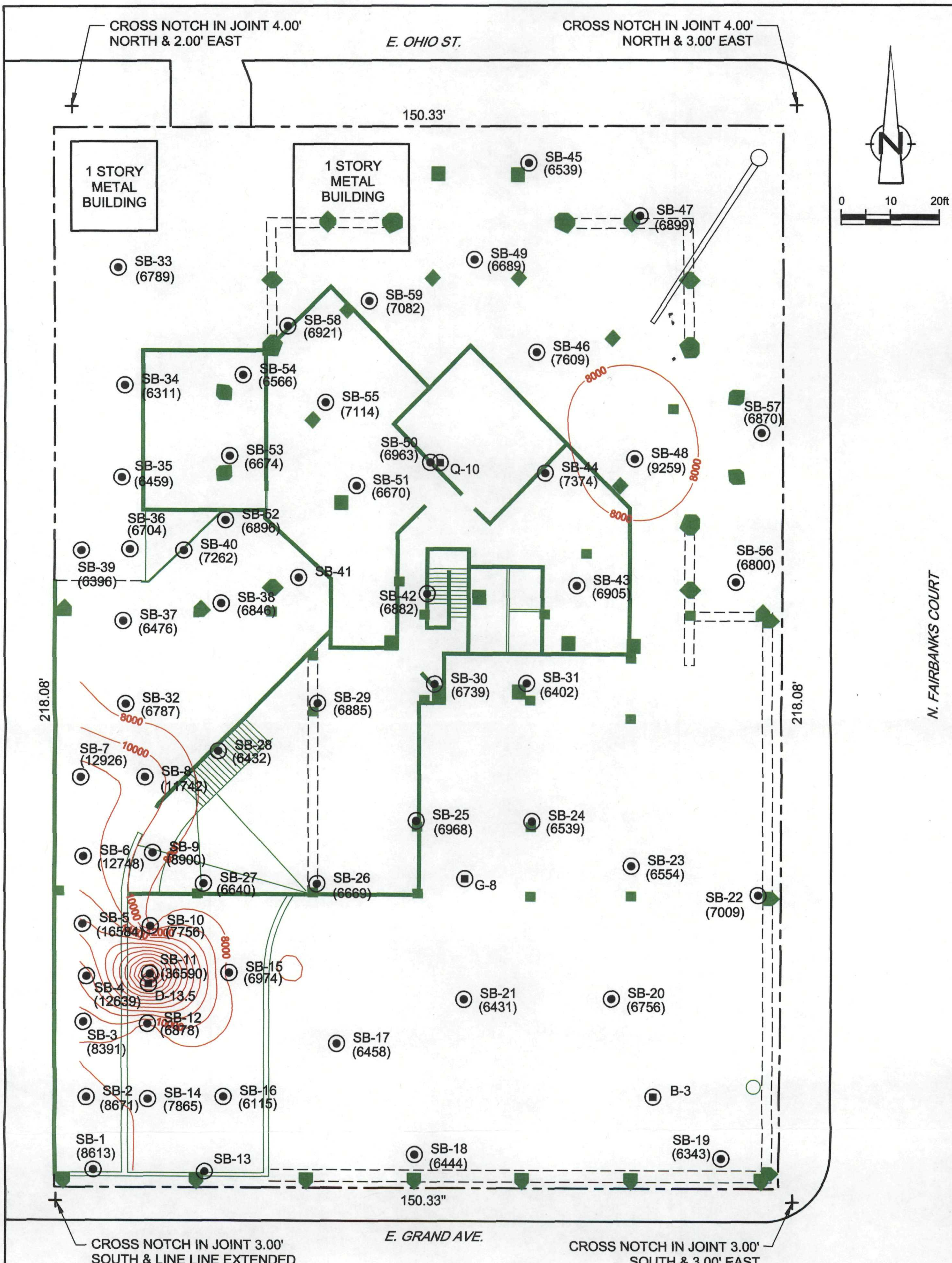
B-3 ▣ INITIAL SOIL BORING LOCATION AND IDENTIFIER

(31221) DOWN-HOLE READING IN COUNTS PER MINUTE

Figure 11

COUNTS PER MINUTE - TEN FOOT INTERVAL
SOIL BORING LOCATIONS
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(AppC002)GN-CO011 FEB 25/2004



LEGEND

B-13 ◉ SUPPLEMENTAL SOIL BORING LOCATION AND IDENTIFIER

B-3 ▣ INITIAL SOIL BORING LOCATION AND IDENTIFIER

(31221) DOWN-HOLE READING IN COUNTS PER MINUTE

CRA

Figure 12

COUNTS PER MINUTE - ELEVEN FOOT INTERVAL
SOIL BORING LOCATIONS
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(AppC002)GN-CO012 FEB 25/2004

TABLE 1

SUMMARY OF LABORATORY RESULTS
247 EAST OHIO
CHICAGO, ILLINOIS

RSSI Sample NO.	Borehole ID	Depth ft bgs[1]	Ac-228 pCi/g[3]	Pb-214 pCi/g	Total pCi/g
011294	SB-1	1-3	0	2.000	2.0
011295	SB-1	7-9	0	3.000	3.0
011296	SB-2	1-3	0	1.560	1.6
011297	SB-2	5-7	1.8	2.540	4.3
011299	SB-3	3-5	0.729	1.360	2.1
011300	SB-3	7-9	0.297	0.460	0.8
011301	SB-4	1-3	1.06	2.130	3.2
011303	SB-4	5-7	107	35.800	**142.8** [4]
011302	SB-4	9-11	0.946	0.792	1.7
011304	SB-5	5-7	2.56	4.470	7.0
011305	SB-5	9-11	0	0.687	0.7
011306	SB-6	1-3	0	1.460	1.5
011307	SB-6	5-7	0.919	2.730	3.6
011308	SB-7	7-9	0.474	1.250	1.7
011309	SB-8	1-3	1.69	3.240	4.9
011310	SB-8	7-9	0	1.910	1.9
011311	SB-9	1-3	1.95	2.920	4.9
011312	SB-9	5-7	90.8	49.400	**140.2**
011313	SB-10	3-5	0.997	1.190	2.2
011314	SB-10	7-9	0	0.797	0.8
011315	SB-11	1-3	1210	1290.000	**2500.0**
011316	SB-11	7-9	6.92	2.270	**9.2**
011317	SB-11	9-11	1.56	0.467	2.0
011318	SB-12	1-3	1.13	1.590	2.7
011319	SB-12	3-5	2.38	5.720	**8.1**
011320	SB-13	3-5	1.94	2.220	4.2
011321	SB-14	1-3	51.7	9.680	**61.4**
011322	SB-14	3-5	7.35	1.770	**9.1**
011323	SB-15	1-3	1.33	1.240	2.6
011325	SB-16	3-5	0.491	0.517	1.0
011326	SB-17	3-5	0.469	0.668	1.1
011327	SB-18	1-3	0	1.020	1.0
011328	SB-19	3-5	1.22	1.610	2.8
011329	SB-20	3-5	0.441	0.563	1.0
011330	SB-21	3-5	0.594	0.622	1.2
011331	SB-22	3-5	0	0.919	0.9
011332	SB-23	1-3	0.663	0.955	1.6
011333	SB-24	1-3	0.74	1.000	1.7
011334	SB-24	5-7	0	0.629	0.6
011335	SB-25	2-4	0.684	1.100	1.8
011336	SB-26	2'-4'	0.925	2.090	3.0
011337	SB-26	4'-6'	0	1.080	1.1

TABLE 1

SUMMARY OF LABORATORY RESULTS
247 EAST OHIO
CHICAGO, ILLINOIS

RSSI Sample NO.	*Borehole ID*	*Depth ft bgs*[1]	*Ac-228 pCi/g*[3]	*Pb-214 pCi/g*	*Total pCi/g*
011338	SB-27	2'-4'	1.81	3.270	5.1
011339	SB-27	4'-6'	1.54	3.240	4.8
011340	SB-27	8'-10'	0.477	0.898	1.4
011341	SB-28	1'-3'	0.891	2.470	3.4
011342	SB-28	7'-9'	0	1.190	1.2
011343	SB-29	1'-3'	0.738	1.180	1.9
011344	SB-29	5'-7'	0	1.560	1.6
011386	SB-30	1'-3'	0.976	1.850	2.8
011387	SB-30	5'-7'	0.441	1.150	1.6
011388	SB-31	1'-3'	0.952	2.220	3.2
011389	SB-31	7'-9'	0.727	1.230	2.0
011390	SB-33	1'-3'	1.02	2.610	3.6
011391	SB-33	5'-7'	0	1.680	1.7
011392	SB-34	1'-3'	0.957	2.810	3.8
011393	SB-34	5'-7'	0	1.380	1.4
011394	SB-35	1'-3'	0	1.360	1.4
011395	SB-35	3'-5'	0.931	2.240	3.2
011396	SB-36	1'-3'	0	2.590	2.6
011397	SB-36	5'-7'	0	0.880	0.9
011398	SB-37	1'-3'	1.83	3.500	5.3
011399	SB-37	3'-5'	0.676	1.970	2.6
011400	SB-38	1'-3'	0.904	2.810	3.7
011401	SB-38	5'-7'	0	1.960	2.0
011402	SB-39	5'-7'	0.511	1.170	1.7
011403	SB-40	1'-3'	15	11.000	26.0
011404	SB-40	3'-5'	0.478	1.620	2.1
011405	SB-41	1'-3'	0.874	2.260	3.1
011406	SB-42	1'-3'	0.748	2.250	3.0
011407	SB-43	3'-5'	0.556	1.080	1.6
011408	SB-44	3'-5'	0.709	2.440	3.1
011409	SB-45	6'-8'	0	1.050	1.1
011410	SB-46	3'-5	0.768	2.600	3.4
011411	SB-47	1'-3'	0.951	2.080	3.0
011412	SB-48	3'-5'	1.17	1.910	3.1
011413	SB-49	5'-7'	0.607	1.230	1.8
011414	SB-50	4'-6'	0.9	2.410	3.3
011415	SB-52	2'-4'	0.536	1.640	2.2
011416	SB-53	1'-3'	0	2.390	2.4
011417	SB-53	7'-9'	0	1.550	1.6
011418	SB-54	1'-3'	0.856	3.530	4.4
011419	SB-54	5'-7'	0	1.110	1.1
011420	SB-55	1'-3'	0.837	3.040	3.9

TABLE 1

SUMMARY OF LABORATORY RESULTS
247 EAST OHIO
CHICAGO, ILLINOIS

RSSI Sample NO.	*Borehole ID*	*Depth ft bgs*[1]	*Ac-228 pCi/g*[3]	*Pb-214 pCi/g*	*Total pCi/g*
011421	SB-55	5'-7'	0	0.993	1.0
011422	SB-56	1'-3'	1.49	2.890	4.4
011423	SB-57	1'-3'	0.7	1.990	2.7
011424	SB-58	3'-5'	1.03	2.010	3.0
011425	SB-59	3'-5'	0	0.970	1.0
011426	B3	1'-3'	0.604	2.500	3.1
011427	G8	1'-3'	0.659	3.320	4.0

[1] ft bgs - feet below ground surface
[2] uCi/g - micro Curries per gram
[3] pCi/g - pico Curries per gram
[4] 142.800 - value exceeds USEPA cleanup objective of 7.1 pCi/g.

ATTACHMENT A

SOIL BORING STRATIGRAPHIC LOGS

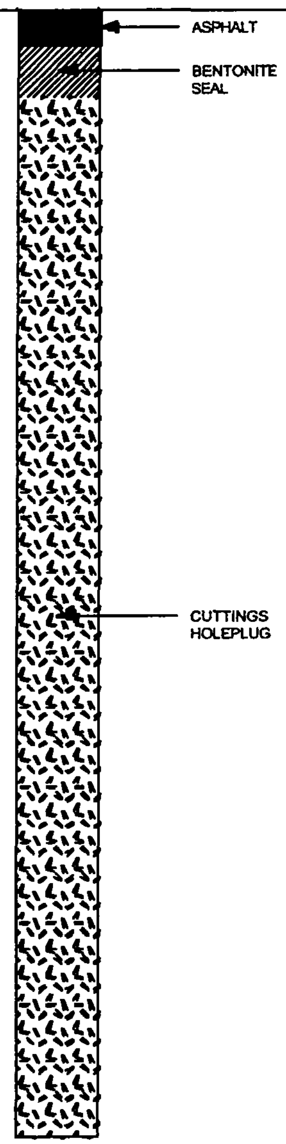
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-1
PROJECT NUMBER: 17770
DATE COMPLETED: April 16, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft
	GROUND SURFACE	12.9
	ASPHALT	12.51
	GRAVEL	12.31
	ML-SILT (FILL), black to dark brown, some sand, gravel and red brick fragments, moist	
	- Red brick fragments at 3.0ft BGS	
	SP-SAND, tan, fine grained, medium dense, little gravel, moist	5.41
	- Trace gravel at 10.0ft BGS	
	END OF BOREHOLE @ 13.0ft BGS	-0.09

[1] CPM = Counts Per Minute

BOREHOLE COMPLETION



SAMPLE

DEPTH ft BGS	NUMBER	'N' VALUE (REC ft)	CPM [1]
1			34306
2	01	13 (0.9)	39369
3			43093
4	02	10 (0.2)	43320
5			40756
6	03	24 (0.7)	29808
7			18984
8	04	20 (1.3)	10398
9			8734
10	05	27 (1.1)	8150
11			8613
12	06	25	10245
13			7930

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

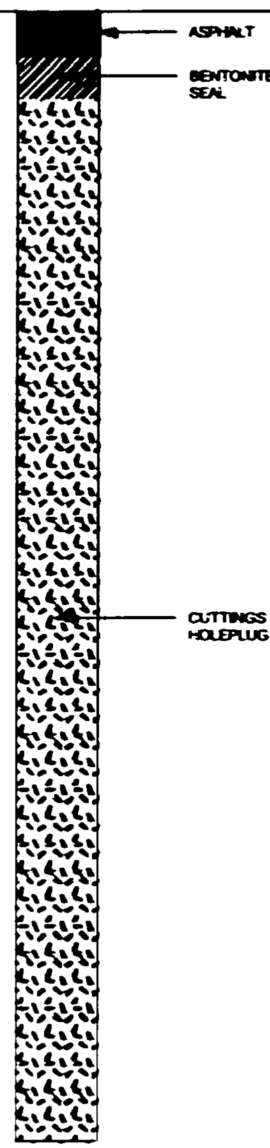
PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-2
DATE COMPLETED: April 16, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft
	GROUND SURFACE	13.7
	ASPHALT	13.35
	GRAVEL	13.15
	ML-SILT (FILL), dark brown, stiff, some sand, gravel and red brick fragments, moist	
	- Mostly brick fragments at 4.5ft BGS	
	SP-SAND, tan, fine grained, poorly graded, trace gravel, moist	6.25
	- Fine to medium grained, little coarse grained at 9.3ft BGS	
	- Little gravel at 10.5ft BGS	
	END OF BOREHOLE @ 13.0ft BGS	0.75

[1] CPM = Counts Per Minute

BOREHOLE COMPLETION



SAMPLE NUMBER	'N' VALUE (REC ft)	CPM [1]
		32353
S1	28 (0.8)	33106
		46314
S2	8 (0.8)	58074
		65846
S3	8 (1.0)	60149
		38141
S4	23 (1.2)	17925
		10316
S5	62 (1.3)	8977
		8671
S6	33 (1.4)	10818
		9451

Depth scale (ft BGS): 2, 4, 6, 8, 10, 12, 14

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE. REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ◯

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-3
PROJECT NUMBER: 17770
DATE COMPLETED: April 16, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION
	GROUND SURFACE	13.9	
0	ASPHALT		ASPHALT
	GRAVEL/RUBBLE	13.53	BENTONITE SEAL
2.8	ML-SILT (FILL), black to brown, stiff, some sand, little gravel, moist	11.13	CUTTINGS HOLEPLUG
	- Trace coal or slag fragments and wood fragments at 5.5ft BGS		
6.8	CL-SANDY CLAY (FILL), gray, stiff, little gravel, moist	7.13	
7.6	SP-SAND, tan, fine to medium grained, medium dense, trace gravel, moist	6.33	
	- Little coarse grained gravel at 9.0ft BGS		
13.0	END OF BOREHOLE @ 13.0ft BGS	0.93	

[1] CPM = Counts Per Minute

DEPTH ft BGS	SAMPLE NUMBER	'N' VALUE (REC ft)	CPM [1]
1			12623
2	01	12 (0.6)	21075
3			39598
4	02	10 (0.8)	50991
5			58707
6	03	4 (0.5)	52387
7			21881
8	04	10 (1.7)	13615
9			9738
10	05	40 (1.0)	9034
11			8391
12	06	31	8483
13			7172

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG ACME.GPJ CRA_CORP.GDT 6/15/01

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-4
DATE COMPLETED: April 19, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION
	GROUND SURFACE	14	
	ASPHALT		ASPHALT
	GRAVEL/RUBBLE	13.59	BENTONITE SEAL
	ML-SILT (FILL), dark brown, stiff, little sand and gravel, trace slag, moist	12.99	
	- Bricks at 6.5ft BGS		CUTTINGS HOLEPLUG
	- 3 - 4" sandy clay, gray, moist at 7.2ft BGS		
	SP-SAND, tan, fine to medium grained, medium dense, trace gravel, moist	6.46	
	- Medium to fine grained, little coarse grained sand and gravel at 11.5ft BGS		
	END OF BOREHOLE @ 13.0ft BGS	0.96	

Depth scale (ft BGS): 2, 4, 6, 8, 10, 12, 14

SAMPLE NUMBER	'N' VALUE (REC ft)	CPM [1]
		52227
[illegible]	18 (1.2)	62398
		123342
[illegible]	20 (0.6)	205457
		582586
[illegible]	5 (0.7)	1392437
		857261
[illegible]	10 (1.2)	166056
		38098
[illegible]	19 (1.4)	15549
		12639
[illegible]	25	27936
		12549

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ◯

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-5
PROJECT NUMBER: 17770
DATE COMPLETED: April 16, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION	SAMPLE NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	14					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE	13.61	BENTONITE SEAL				12565
2				01		10 (0.7)	24512
	ML-SILT (FILL), dark brown, little sand and gravel, trace slag, little brick fragments, moist	11.41					44467
4				02		17 (0.4)	85002
							175580
6	- Tan bricks at 6.0ft BGS			03		8	365457
			CUTTINGS HOLEPLUG				154910
	SP-SAND, tan, fine to medium grained, little gravel, loose, moist	6.51					
8				04		2 (NR [2])	44667
							27822
10				05		4 (1.2)	18691
							16584
12				06		13	16486
	END OF BOREHOLE @ 13.0ft BGS	1.01					10928
14							

[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-6
PROJECT NUMBER: 17770
DATE COMPLETED: April 16, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION	SAMPLE NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM[1]
	GROUND SURFACE	14.2					
	ASPHALT	13.83	ASPHALT				
	Red bricks	12.83	BENTONITE SEAL				16802
2	ML-SILT (FILL), dark brown, stiff, some sand, gravel and red brick fragments, moist			[illegible]	X	13 (0.4)	21123
							24606
4				[illegible]	X	14 (0.4)	29305
							37178
6	- Bricks at 5.5ft BGS			[illegible]	X	24 (1.0)	47588
			CUTTINGS HOLEPLUG				41328
8	SP-SAND, tan, fine to medium grained, medium dense, little gravel, trace coarse grains, moist	6.23		[illegible]	X	19 (0.3)	29322
							16391
10				[illegible]	X	10 (1.0)	12947
							12748
12				[illegible]	X	32 (1.0)	9377
	END OF BOREHOLE @ 13.0ft BGS	1.23					8079
14							

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

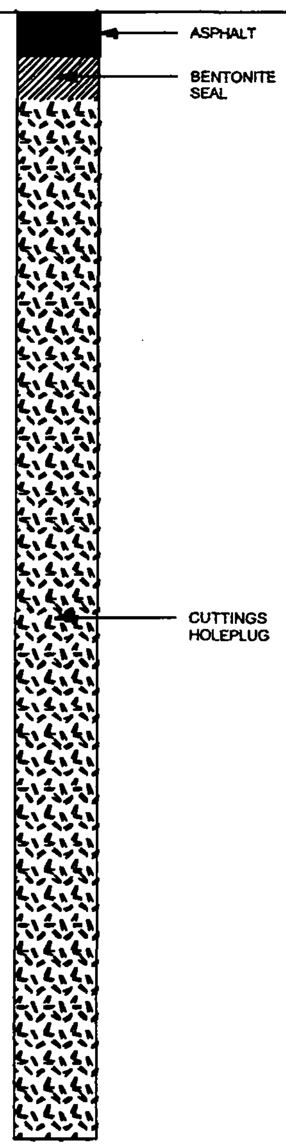
CHEMICAL ANALYSIS ◯

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO | HOLE DESIGNATION: SB-7
PROJECT NUMBER: 17770 | DATE COMPLETED: April 16, 2001
CLIENT: DRAPER & KRAMER | DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS | FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	SAMPLE NUMBER	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	14.1			
	ASPHALT				
	GRAVEL/RUBBLE	13.67			
1					7357
2			01	18 (0.9)	7461
3					9035
4			02	16 (1.0)	14716
	ML-SILT (FILL), dark brown, stiff, some sand, little gravel and brick fragments, moist	9.57			
5					34919
6			03	11 (NR [2])	73990
	- Occasional rounded gravel seam at 6.5ft BGS				
7					63495
8			04	7 (0.9)	34866
9					22111
10			05	7 (0.9)	14222
	SP-SAND, tan, fine to medium grained, trace coarse grained, little gravel, moist	3.27			
11					12926
12			06	14 (1.2)	12890
13	END OF BOREHOLE @ 13.0ft BGS	1.07			10176
14					

BOREHOLE COMPLETION



[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG ACME.GPJ CRA_CORP.GDT 6/15/01

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-8
DATE COMPLETED: April 16, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft
	GROUND SURFACE	14.2
	ASPHALT	13.84
	GRAVEL	13.64
	ML-SANDY SILT (FILL), dark brown, some gravel, little brick fragments, moist	5.04
	SP-SAND, tan, fine grained, medium dense, trace gravel, moist	1.24
	END OF BOREHOLE @ 13.0 ft BGS	

BOREHOLE COMPLETION: ASPHALT; BENTONITE SEAL; CUTTINGS HOLEPLUG

DEPTH ft BGS	SAMPLE NUMBER	'N' VALUE (REC ft)	CPM[1]
1			21956
2	S1	13 (1.3)	37489
3			55734
4	S2	7 (NR[2])	63107
5			62741
6	S3	4 (NR[2])	51494
7			36237
8	S4	4 (0.8)	-
9			12417
10	S5	26 (1.2)	9805
11			11742
12	S6	62 (1.0)	9518
13			6611

[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-9
PROJECT NUMBER: 17770
DATE COMPLETED: April 16, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION	SAMPLE NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	14					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE	13.62	BENTONITE SEAL				
	ML-SANDY SILT (FILL), dark brown, some gravel, little brick fragments, trace slag, moist	13.12					31191
2				01		21 (1.2)	64713
							134786
4				02		23 (1.3)	155701
							248111
6				03		5 (1.1)	270978
	SP-SAND, tan, fine to medium grained, dense, trace gravel, moist	7.22	CUTTINGS HOLEPLUG				63631
8				04		4 (1.0)	21382
							10602
10				05		45 (1.1)	7870
							8900
12				06		47 (1.3)	9673
	END OF BOREHOLE @ 13.0ft BGS	1.02					6542
14							

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-10
DATE COMPLETED: April 17, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION
	GROUND SURFACE	14	
	ASPHALT	13.57	ASPHALT
	GRAVEL	13.37	BENTONITE SEAL
	ML-SANDY SILT (FILL), dark brown, stiff, little gravel, slag and brick fragments, moist		CUTTINGS HOLEPLUG
	- Bricks and rubble at 3.5ft BGS		
	SP-SAND, tan, fine to medium grained, trace coarse grained, dense, little gravel, moist	5.17	
	END OF BOREHOLE @ 13.0ft BGS	0.97	

[1] CPM = Counts Per Minute

DEPTH ft BGS	SAMPLE NUMBER	'N' VALUE (REC ft)	CPM [1]
1			24367
2	[illegible]	12 (1.0)	49852
3			46746
4	[illegible]	18 (0.7)	42802
5			58245
6	[illegible]	9 (0.4)	47298
7			19581
8	[illegible]	11 (0.8)	12704
9			9005
10	[illegible]	33 (1.1)	7748
11			7756
12	[illegible]	45 (1.0)	6896
13			6617

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE. REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG ACME (MPJ CRA_CTMP.GDT 8/1/01

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

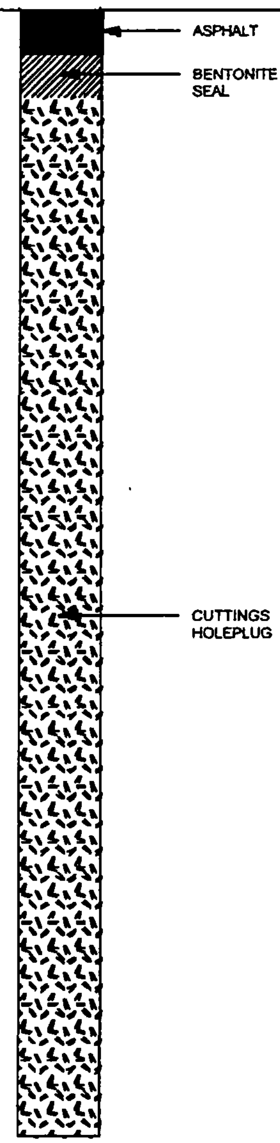
PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-11
PROJECT NUMBER: 17770
DATE COMPLETED: April 17, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft
	GROUND SURFACE	13.8
	ASPHALT	13.45
	GRAVEL	13.25
	ML-SANDY SILT (FILL), dark brown, stiff, little gravel, slag and brick fragments, moist	
	- 3 - 5" silver gray sand (elevated radiation level) at 1.5ft BGS	
	- Bricks and rubble at 3.5ft BGS	
	SP-SAND (FILL), brown, loose, little silt, trace gravel, moist	6.35
	SP-SAND, tan, fine grained, dense, little gravel, moist	5.35
	END OF BOREHOLE @ 13.0ft BGS	0.85

[1] CPM = Counts Per Minute

[2] NR = No Recovery

BOREHOLE COMPLETION



SAMPLE

DEPTH ft BGS	NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
1				941777
2	01		16 (0.9)	2239317
3				795526
4	02		24 (0.3)	255023
5				140670
6	03		17 (NR [2])	89164
7				23662
8	04		5 (1.0)	12184
9				9230
10	05		41 (1.4)	10381
11				36590
12	06		48 (1.2)	8968
13				57181

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG ACME.GPJ CRA_CORP.GDT 6/15/01

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-12
DATE COMPLETED: April 17, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	13.7					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE	13.3	BENTONITE SEAL				
1	ML-SANDY SILT, dark brown, stiff, some gravel, little brick fragments and slag, moist	12.7					39052
2				[illegible]	X	12 (0.8)	64254
3							71867
3.5	- Brick fragments and rubble at 3.5ft BGS						
4				[illegible]	X	6 (0.5)	98919
5							106794
6			CUTTINGS HOLEPLUG	[illegible]	X	3 (0.4)	66467
7							25362
	SP-SAND (FILL), brown, loose, little silt, trace gravel, moist	8.4					
8				[illegible]	X	7 (1.3)	11113
	SP-SAND, tan, fine grained, medium dense, little gravel, moist	5					
9							8984
10				[illegible]	X	28 (1.0)	10524
11	END OF BOREHOLE @ 11.0ft BGS	2.7					6878

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

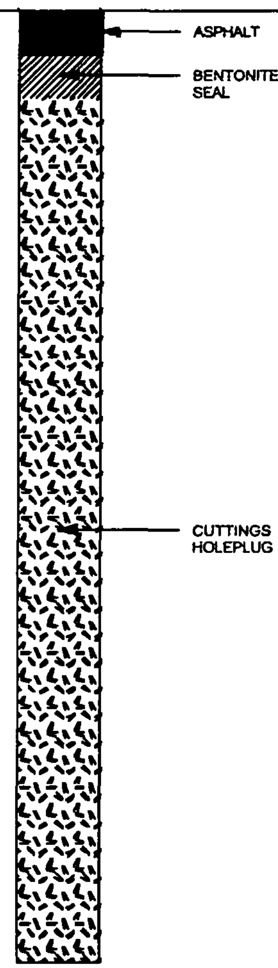
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-13
DATE COMPLETED: April 17, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	SAMPLE NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	13.2				
	ASPHALT	12.78				
	GRAVEL	12.38				
	ML-SANDY SILT (FILL), dark brown, firm, some gravel, little brick fragments, moist					31221
2			01	X	5 (0.7)	49254
						45202
	- Bricks and rubble at 3.5ft BGS					
4			02	X	7 (0.4)	45565
						44411
6			03	X	6 (0.3)	38341
						13655
	SP-SAND (FILL), brown, loose, little silt, trace gravel, moist	5.48				
8			04	X	2 (1.1)	-
	SP-SAND, tan, fine to medium grained, trace coarse grained, medium dense, little gravel, moist	4.18				9207
10			05	X	14 (1.0)	9750
	END OF BOREHOLE @ 11.0ft BGS	2.18				-
12						
14						

BOREHOLE COMPLETION



[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ◯

OVERBURDEN LOG ACME.GPJ CRA_CORP.GDT 6/15/01

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-14
DATE COMPLETED: April 17, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION
	GROUND SURFACE	13.5	
	ASPHALT		ASPHALT
	GRAVEL	13.09	BENTONITE SEAL
	ML-SANDY SILT (FILL), dark brown, firm, little gravel, brick fragments, slag, moist	12.89	
			CUTTINGS HOLEPLUG
	SC-SAND (FILL), dark brown, stiff, some clay, trace gravel, moist	6.19	
	SP-SAND, tan, fine to medium grained, trace coarse grained, medium dense, little gravel, moist	4.89	
	END OF BOREHOLE @ 11.0ft BGS	2.49	

[1] CPM = Counts Per Minute

SAMPLE

NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
			114356
[illegible]	X	5 (0.9)	234427
			132254
[illegible]	X	3 (0.9)	105418
			105137
[illegible]	X	2 (1.0)	69261
			25748
[illegible]	X	11 (0.3)	11388
			9355
[illegible]	X	15 (1.2)	17621
			7865

Depth scale: 2, 4, 6, 8, 10, 12, 14

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE. REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-15
PROJECT NUMBER: 17770
DATE COMPLETED: April 17, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft
	GROUND SURFACE	13.7
	ASPHALT	13.31
	GRAVEL	13.11
	ML-SANDY SILT (FILL), dark brown, stiff, little gravel, bricks and slag, moist	9.21
	SC-SAND (FILL), dark brown, fine grained, loose, some clay, trace gravel, moist	5.01
	SP-SAND, tan, fine to medium grained, trace coarse grained, little gravel, moist	2.71
11.0	END OF BOREHOLE @ 11.0ft BGS	

[1] CPM = Counts Per Minute

[2] NR = No Recovery

BOREHOLE COMPLETION: ASPHALT; BENTONITE SEAL; CUTTINGS HOLEPLUG

SAMPLE

DEPTH ft BGS	NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
1				15211
2	01	X	10 (0.6)	17849
3				17889
4	02	X	6 (NR [2])	16963
5				13589
6	03	X	4 (1.5)	11048
7				9465
8	04	X	2 (0.3)	8557
9				7092
10	05	X	18 (1.2)	6636
11				6974

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG ACME.GPJ CRA_CORP.GDT 6/15/01

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-16
DATE COMPLETED: April 17, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM [1]
	GROUND SURFACE	13.5					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE	13.07	BENTONITE SEAL				
	ML-SANDY SILT (FILL), dark brown, stiff, some gravel, little bricks and slag, moist	12.47					14261
2				[illegible]	X	14 (NR [2])	14256
							14168
	SC-SAND (FILL), dark brown, loose, some clay, little gravel and brick fragments, moist	10.17					
4				[illegible]	X	5 (1.2)	12808
							11629
6			CUTTINGS HOLEPLUG	[illegible]	X	7 (NR [2])	9552
	SP-GRAVELLY SAND (FILL), tan to gray, fine to medium grained, medium dense	6.47					6278
8				[illegible]	X	25 (1.0)	6051
	SP-SAND, tan, fine to medium grained, dense, little gravel, moist	4.67					6652
10				[illegible]	X	47	6309
	END OF BOREHOLE @ 11.0ft BGS	2.47					6115
12							
14							

[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO | HOLE DESIGNATION: SB-17

PROJECT NUMBER: 17770 | DATE COMPLETED: April 17, 2001

CLIENT: DRAPER & KRAMER | DRILLING METHOD: 4 1/4" ID HSA

LOCATION: CHICAGO, ILLINOIS | FIELD PERSONNEL: W. POCHRON

CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM [1]
	GROUND SURFACE	13.5					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE	13.07	BENTONITE SEAL				
	BRICK AND RUBBLE	12.47					15412
2				01	X	25 (NR [2])	18056
	SC-SAND, brown, loose, some clay, trace gravel, moist	10.97					
							14969
4				02	X	5 (1.1)	9802
	- Rubble at 5.0ft BGS						9373
6			CUTTINGS HOLEPLUG	03	X	2 (NR [2])	8271
							6938
8				04	X	4 (1.6)	7095
							6781
	SP-SAND, tan, fine to medium grained, trace coarse grained, medium dense, little gravel, moist	4.27					
10				05	X	28 (1.0)	6578
	END OF BOREHOLE @ 11.0ft BGS	2.47					6458
12							
14							

[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-18

PROJECT NUMBER: 17770
DATE COMPLETED: April 17, 2001

CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA

LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON

CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM [1]
	GROUND SURFACE	13					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE	12.61	BENTONITE SEAL				
	SC-SAND (FILL), dark brown, fine to medium grained, some clay, trace gravel, moist	12.41					17901
	- Gravel/rubble layers at 1.4ft BGS						
2				[illegible]		13 (1.0)	11055
							10781
4				[illegible]		7 (0.8)	9782
							9411
6			CUTTINGS HOLEPLUG	[illegible]		4 (1.4)	9248
	- Rubble at 6.8ft BGS						10435
8				[illegible]		8 (1.5)	13437
	SP-SAND (FILL), dark brown, fine to medium grained, trace coarse grained, little gravel, moist	4.21					7586
10				[illegible]		23 (1.2)	6925
	END OF BOREHOLE @ 11.0ft BGS	2.01					6444
12							
14							

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-19
PROJECT NUMBER: 17770
DATE COMPLETED: April 17, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	12.9					
	ASPHALT	12.54	ASPHALT				
	GRAVEL	12.44	BENTONITE SEAL				
	BRICK FRAGMENTS	12.14					
	SC-SAND (FILL), brown, loose, little clay and gravel, trace bricks, moist						17437
2				01		3 (1.2)	12980
							10096
4				02		6 (1.3)	15412
	- Some clay, reddish brown at 5.0ft BGS						12127
6	- Thin gravel seam at 6.1ft BGS		CUTTINGS HOLEPLUG	03		4 (1.6)	8279
	- Little clay at 6.5ft BGS						
							8625
8				04		4 (1.5)	8012
							6738
	SP-SAND, tan, fine to medium grained, trace coarse grained, medium dense, little gravel, moist	3.64					
10				05		27 (0.9)	6713
	END OF BOREHOLE @ 11.0ft BGS	1.94					6343
12							
14							

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ◯

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-20
DATE COMPLETED: April 17, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION
GROUND SURFACE	13.5	
ASPHALT	13.12	ASPHALT
GRAVEL	12.92	BENTONITE SEAL
BRICKS AND RUBBLE	10.62	
SC-SAND (FILL), dark brown, loose, some clay, trace gravel, wood and bricks, moist		CUTTINGS HOLEPLUG
- Little clay, medium dense at 6.5ft BGS		
- 3" gravel seam at 9.0ft BGS	4.22	
SP-SAND, gray to tan, fine to medium grained, trace coarse grained, medium dense, little gravel, moist	2.52	
END OF BOREHOLE @ 11.0ft BGS		

DEPTH ft BGS	NUMBER	'N' VALUE (REC ft)	CPM [1]
1			14391
2	S1	50+ (NR [2])	13765
3			12467
4	S2	2 (0.8)	9569
5			8302
6	S3	2 (1.7)	8666
7			8108
8	S4	19 (1.6)	7670
9			8033
10	S5	27 (1.3)	7083
11			6756

[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-21
DATE COMPLETED: April 17, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION
	GROUND SURFACE	13.7	
	ASPHALT	13.37	ASPHALT
	GRAVEL	13.17	
	ML-SILT (FILL), little gravel	12.77	BENTONITE SEAL
	BRICKS AND RUBBLE	11.27	
	SC-SAND (FILL), brown, loose, little gravel, trace brick fragments and wood, moist		
	- Little gravel at 5.1ft BGS		CUTTINGS HOLEPLUG
	- Trace gravel, no brick fragments or wood at 7.2ft BGS		
	SP-SAND, grayish brown, fine to medium grained, medium dense, trace gravel, moist	4.87	
11.0	END OF BOREHOLE @ 11.0ft BGS	2.67	

[1] CPM = Counts Per Minute

[2] NR = No Recovery

SAMPLE

Depth (ft BGS)	NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
1				16463
2	01	X	50+ (NR [2])	11886
3				11114
4	02	X	5 (1.0)	11729
5				10175
6	03	X	3 (0.9)	9159
7				9287
8	04	X	4 (1.3)	8730
9				6668
10	05	X	25 (1.4)	6654
11				6431

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-22
DATE COMPLETED: April 18, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION
	GROUND SURFACE	13.3	
	ASPHALT	13.04	ASPHALT
	GRAVEL	12.84	BENTONITE SEAL
	RUBBLE AND BRICKS		
4	ML-SILT (FILL), dark brown, stiff, some sand, trace gravel and slag, moist	9.34	
	SC-SAND (FILL), brown, loose, some clay, little gravel, trace bricks and wood, moist	7.84	CUTTINGS HOLEPLUG
	- Little clay, grayish brown, medium dense at 7.5ft BGS		
	- Rubble at 8.8ft BGS		
	SP-SAND, brownish grey, fine to medium grained, medium dense, trace gravel, moist	4.04	
	END OF BOREHOLE @ 11.0ft BGS	2.34	

SAMPLE

DEPTH ft BGS	NUMBER	'N' VALUE (REC ft)	CPM [1]
1			17502
2	S1	50+ (NR [2])	16046
3			12340
4	S2	19 (0.3)	9986
5			10474
6	S3	4 (0.9)	8292
7			8057
8	S4	19 (1.7)	8676
9			7740
10	S5	25 (1.0)	8914
11			7009

[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-23
PROJECT NUMBER: 17770
DATE COMPLETED: April 18, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION
	GROUND SURFACE	13.6	
	ASPHALT	13.26	ASPHALT
	GRAVEL	13.08	BENTONITE SEAL
	ML-SILT (FILL), dark brown, stiff, some sand and gravel, brick fragments, trace slag, moist	10.76	CUTTINGS HOLEPLUG
	SC-SAND (FILL), brown, fine to medium grained, loose, little clay and gravel, moist - Some rubble fragments at 7.5ft BGS - Rubble at 8.8ft BGS	4.26	
	SP-SAND, brownish gray, fine grained, dense, trace gravel, moist	2.56	
	END OF BOREHOLE @ 11.0ft BGS [1] CPM = Counts Per Minute		

SAMPLE

DEPTH ft BGS	NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
1		1–3		12944
2	01		11 (1.0)	12324
3		3–5		10980
4	02		5 (0.4)	11047
5		5–7		10038
6	03		2 (1.6)	8915
7		7–9		8409
8	04		14 (1.4)	7889
9		9–11		6714
10	05		32 (1.5)	7405
11				6554

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

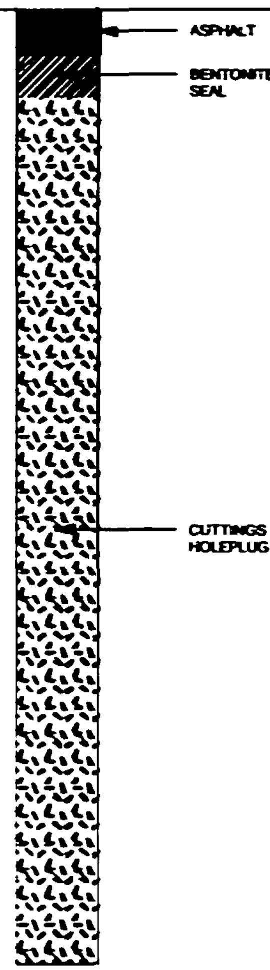
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-24
DATE COMPLETED: April 18, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM[1]
	GROUND SURFACE	13.7				
	ASPHALT	13.45				
	GRAVEL	13.25				
	ML-SILT (FILL), dark brown, firm, some sand and gravel/rubble, trace slag and wood, moist					11209
	SC-SAND (FILL), dark brown, loose, little clay, gravel/rubble, moist	12.25				
2			[illegible]		6 (1.1)	14738
						14565
4			[illegible]		7 (NR[2])	10705
						10345
6			[illegible]		7 (1.4)	12017
						10206
8			[illegible]		3 (1.3)	7947
						7739
	SP-SAND, brownish gray, fine grained, medium dense, little gravel, moist	4.35				
10			[illegible]		20	6598
	END OF BOREHOLE @ 11.0ft BGS	2.75				6639
12						
14						

BOREHOLE COMPLETION



[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-25
DATE COMPLETED: April 18, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	'N' VALUE (REC ft)	CPM[1]
	GROUND SURFACE	13.9					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE	13.56	BENTONITE SEAL				11664
2	ML-SANDY SILT (FILL), dark brown, firm, little gravel and bricks, trace slag and wood, moist	11.86					17365
				01	X	4 (1.0)	15298
	SC-SAND (FILL), dark brown, loose, little clay, gravel and bricks, moist	10.36					
4							12529
				02	X	7 (1.3)	11956
	- Sand seam with some gravel at 5.5ft BGS						
6			CUTTINGS HOLEPLUG				11484
				03	X	3 (1.5)	9398
8							8584
	- Sand, rubble and slag at 9.0ft BGS			04	X	37 (1.8)	7290
	SP-SAND, tan, fine to medium grained, dense, little gravel, moist	4.36					
10							6712
	END OF BOREHOLE @ 11.0ft BGS	2.86					6968
12							
14							

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-26
DATE COMPLETED: April 18, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION
	GROUND SURFACE	14	
	ASPHALT	13.67	ASPHALT
	GRAVEL/RUBBLE/BRICKS	12.97	BENTONITE SEAL
	CONCRETE SLAB	12.47	
	SAND/GRAVEL (FILL)	11.97	
2	SC-SAND, dark brown, loose, little clay and gravel/rubble, trace slag and wood, moist		CUTTINGS HOLEPLUG
	- 3-4" sand/gravel layer at 5.0ft BGS		
	END OF BOREHOLE @ 11.0ft BGS	2.97	

SAMPLE

DEPTH ft BGS	NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
1				13972
2				18521
3	[illegible]	2–4	10 (1.3)	14194
4				11191
5	[illegible]	4–6	4 (0.9)	7472
6				8602
7	[illegible]	6–8	3 (1.2)	8677
8				8081
9	[illegible]	8–10	50+ (NR [2])	7813
10				7316
11				8889

[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

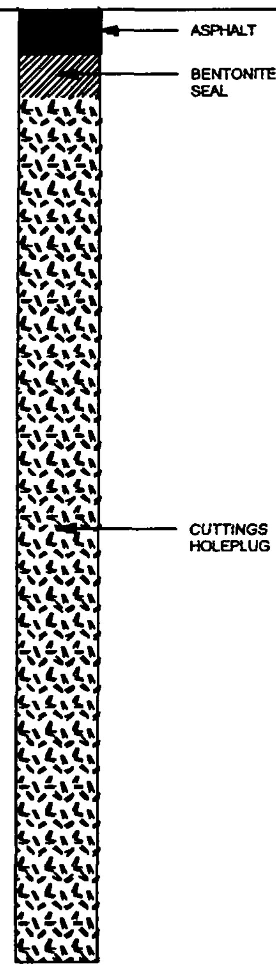
CHEMICAL ANALYSIS ◯

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-27
PROJECT NUMBER: 17770
DATE COMPLETED: April 18, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	SAMPLE NUMBER	SAMPLE INTERVAL	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	14.1				
0	ASPHALT					
0.5	GRAVEL/RUBBLE	13.61				
1						16475
1.8	ML-SANDY SILT (FILL), dark brown, stiff, little gravel/rubble, trace slag and metal fragments, and wood, moist	12.31				
2				2–4		25449
3			01		13 (1.1)	34238
4				4–6		32080
5			02		13 (1.2)	24951
6	- Rubble at 6.0ft BGS			6–8		17658
7			03		10 (0.4)	14420
8				8–10		9696
9			04		20 (1.0)	7417
9.3	SP-SAND, grayish brown, medium dense, some gravel, trace clay, moist	4.81				
10						7116
11	END OF BOREHOLE @ 11.0ft BGS	3.11				6640

BOREHOLE COMPLETION



[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ◯

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-28
DATE COMPLETED: April 18, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM [1]
	GROUND SURFACE	14.4					
	ASPHALT	14.07	ASPHALT				
	GRAVEL	13.77					
	ML-SANDY SILT (FILL), dark brown, little gravel/rubble/bricks, trace clay, moist		BENTONITE SEAL				19930
2	BRICKS AND RUBBLE	12.37		S1		54 (1.3)	18514
							19854
4				S2		39 (1.1)	18733
							16881
6			CUTTINGS HOLEPLUG	S3		43 (1.4)	15071
							7349
8				S4		50+ (0.7)	5845
	SP-SAND, tan, fine grained, very dense, trace gravel, moist	5.57					6896
10				S5		57 (1.2)	6536
	END OF BOREHOLE @ 11.0 ft BGS	3.37					6432
12							
14							

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG ACME.GPJ CRA_CORP.GDT 9/18/01

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-29
PROJECT NUMBER: 17770
DATE COMPLETED: April 18, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION
	GROUND SURFACE	14.3	
	ASPHALT	14.05	ASPHALT
	GRAVEL	13.85	BENTONITE SEAL
	ML-SANDY SILT (FILL), dark brown, firm, little gravel/rubble, trace slag, wood and coal, moist - Bricks and rubble at 2.5ft BGS	9.65	CUTTINGS HOLEPLUG
	SC-SAND (FILL), dark brown, loose, little clay and gravel/rubble, trace bricks, coal and slag, moist - Rubble at 8.2ft BGS	4.65	
	SP-SAND, tan, loose, trace gravel, moist	3.35	
	END OF BOREHOLE @ 11.0ft BGS [1] CPM = Counts Per Minute [2] NR = No Recovery		

SAMPLE

DEPTH ft BGS	NUMBER	'N' VALUE (REC ft)	CPM [1]
			-
			15907
2	01	5 (1.0)	15915
			15946
4	02	3 (1.2)	13715
			12907
6	03	3 (1.0)	11733
			10365
8	04	50+ (NR [2])	9610
			8559
10	05	5 (1.8)	8619
			6685

Depth scale: 2, 4, 6, 8, 10, 12, 14

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-30
DATE COMPLETED: April 18, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION	SAMPLE NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	14.3					
	ASPHALT	13.97	ASPHALT				
	GRAVEL	13.77	BENTONITE SEAL				
	ML-SILT (FILL), dark brown, fine, sandy, some gravel/rubble, trace of slag and wood, moist						17025
2				S1	X	6 (1.0)	12365
	SC-SAND (FILL), dark brown, loose, some clay, little gravel/rubble, moist	11.47					11046
	- 3" - 4" sand and gravel/rubble seam at 3.4ft BGS						
4				S2	X	6 (1.4)	11565
							12165
6			CUTTINGS HOLEPLUG	S3	X	5 (1.6)	15661
							10524
8				S4	X	8 (1.5)	8679
							7044
10				S5	X	24 (1.0)	6662
	- Rubble to 11.3" at 10.5ft BGS						
	SP-SAND, tan, fine grained, dense, trace of gravel, moist	3.27					6739
12				S6	X	35 (1.3)	
	END OF BOREHOLE @ 13.0ft BGS	1.27					
14							

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ○

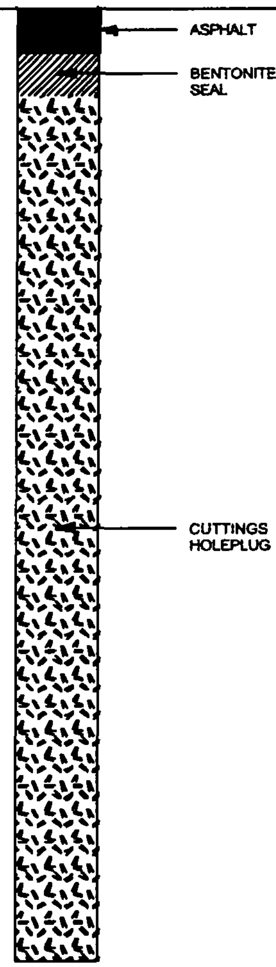
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-31
DATE COMPLETED: April 18, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft
	GROUND SURFACE	14.2
	ASPHALT	13.94
	GRAVEL	13.74
	ML-SILT (FILL), dark brown, firm, some gravel/rubble, trace of slag, coal and wood, moist	11.34
	SC-SAND (FILL), dark brown, loose, little clay, trace of gravel/rubble, moist	
	- Some gravel, trace of slag and wood at 8.5ft BGS	4.54
	SP-SAND, tan, medium dense, trace of gravel, moist	3.24
	END OF BOREHOLE @ 11.0ft BGS	
	[1] CPM = Counts Per Minute	

BOREHOLE COMPLETION



SAMPLE

DEPTH ft BGS	NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
1				14897
2	01		7 (1.2)	12870
3				11277
4	02		12 (1.0)	10515
5				10800
6	03		6 (1.4)	9580
7				10977
8	04		9 (1.5)	13028
9				8494
10	05		23 (1.3)	6700
11				6402

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-32
DATE COMPLETED: April 18, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM [1]
	GROUND SURFACE	14.2					
	ASPHALT	13.93	ASPHALT				
	GRAVEL	13.73	BENTONITE SEAL				
	ML-SILT (FILL), and gravel - Brick and rubble at 0.88 BGS						17591
2				[illegible]		38 (1.4)	21580
							22348
4				[illegible]		37 (1.5)	22102
							22263
6			CUTTINGS HOLEPLUG	[illegible]		22 (1.3)	20585
							12722
8				[illegible]		50+ (NR [2])	5917
							6260
		4.93					
10				[illegible]		44	7261
							6787
	SP-SAND, tan, fine grained, dense, trace of gravel, moist						
	END OF BOREHOLE @ 11.0ft BGS						
12	[1] CPM = Counts Per Minute						
	[2] NR = No Recovery	1.23					
14							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

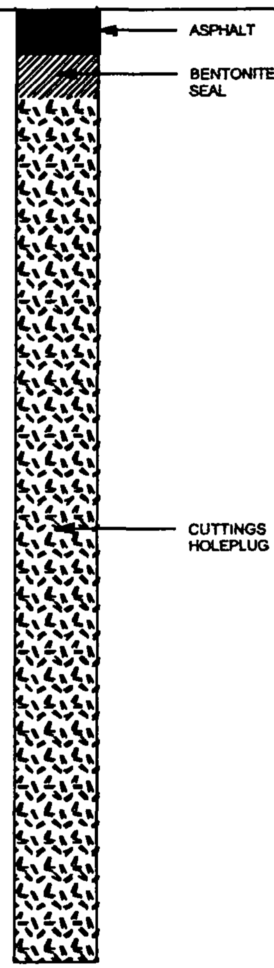
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-33
DATE COMPLETED: April 18, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft
	GROUND SURFACE	13.7
	ASPHALT	13.43
	GRAVEL/RUBBLE	12.83
	ML-SILT (FILL), dark brown, firm, sandy, little gravel/rubble, trace wood, moist	
	- Trace of slag at 3.5ft BGS	
	- 4" fine sand seam at 5.5ft BGS	
	- 4" rubble at 6.2ft BGS	7.33
	SC-SAND (FILL), brown, fine grained, loose, some clay, trace of gravel, wet	5.73
	SP-SAND (FILL), grayish brown, fine grained, loose, trace gravel/rubble, moist	4.23
	SP-SAND, tan, fine grained, medium dense, trace gravel, moist	2.73
	END OF BOREHOLE @ 11.0ft BGS	
	[1] CPM = Counts Per Minute	

BOREHOLE COMPLETION



DEPTH ft BGS	SAMPLE NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
1				15214
2	01	X	8 (1.3)	16967
3				15856
4	02	X	13 (1.4)	14300
5				14341
6	03	X	11 (1.5)	14007
7				-
8	04	X	7	10497
9				7584
10	05	X	27	7034
11				6789

Depth scale: 2, 4, 6, 8, 10, 12, 14

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-34
DATE COMPLETED: April 19, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM [1]
	GROUND SURFACE	14					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE	13.68	BENTONITE SEAL				
	ML-SILT (FILL), dark brown, firm, sandy, little gravel/rubble, trace of slag and wood, moist	12.98					16108
2				S1	X	9 (1.0)	21146
							15156
4				S2	X	12 (1.1)	15912
	SC-SAND (FILL), brown, fine to medium grained, loose, some clay, little gravel/rubble and wood, moist	9.48					10544
6			CUTTINGS HOLEPLUG	S3	X	4 (0.9)	10420
	SP-SAND (FILL), brown, fine grained, loose, trace of clay gravel/rubble, moist	7.48					9591
8	- Little clay, trace of wood at 7.88 BGS			S4	X	11 (1.1)	9800
							8612
10	SP-SAND, tan, fine grained, medium dense, trace of gravel, moist	4.16		S5	X	17 (1.2)	7163
	END OF BOREHOLE @ 11.0ft BGS	2.98					6311
12							
14							

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO

PROJECT NUMBER: 17770

CLIENT: DRAPER & KRAMER

LOCATION: CHICAGO, ILLINOIS

CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-35

DATE COMPLETED: April 19, 2001

DRILLING METHOD: 4 1/4" ID HSA

FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	14.2					
	ASPHALT	13.87	ASPHALT				
	GRAVEL	13.67	BENTONITE SEAL				
	ML-SILT (FILL), brown, very stiff, sandy, little gravel and rubble, trace of slag, moist						16588
2				01		20 (0.8)	13816
	- Trace of coal at 3.2ft BGS						13474
4				02		17 (1.2)	12351
							8130
6			CUTTINGS HOLEPLUG	03		6 (0.2)	9073
	SC-SAND (FILL), brown, loose, little clay, trace of wood, gravel/rubble, moist	7.67					10175
8				04		4 (1.4)	8563
							7844
10	SP-SAND, tan, fine grained, medium dense, trace of gravel, moist	4.37		05		8 (0.9)	6709
	END OF BOREHOLE @ 11.0ft BGS	3.17					6459
	[1] CPM = Counts Per Minute						
12							
14							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-36
DATE COMPLETED: April 18, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION
	GROUND SURFACE	14.1	
	ASPHALT	13.83	ASPHALT
	GRAVEL	13.63	BENTONITE SEAL
	ML-SILT (FILL), sandy, little gravel/rubble, trace of clay, wood and coal		
	- Rubble to 2.0' at 1.5ft BGS		
5.5	SP-SAND (FILL), dark brown to black, fine grained, loose, trace of clay, wood and slag, moist	8.63	CUTTINGS HOLEPLUG
	- Little clay at 7.5ft BGS		
9.4	SP-SAND, tan, fine to medium grained, trace coarse grained, medium dense, trace of gravel, moist	4.73	
11.0	END OF BOREHOLE @ 11.0ft BGS	3.13	

SAMPLE

DEPTH ft BGS	NUMBER	'N' VALUE (REC ft)	CPM [1]
1			24136
2	[illegible]	50+ (NR [2])	62636
3			16076
4	[illegible]	7 (1.0)	14040
5			8338
6	[illegible]	6 (1.2)	9878
7			8975
8	[illegible]	11 (1.1)	8798
9			10454
10	[illegible]	22	7861
11			6704

[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO

PROJECT NUMBER: 17770

CLIENT: DRAPER & KRAMER

LOCATION: CHICAGO, ILLINOIS

CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-37

DATE COMPLETED: April 19, 2001

DRILLING METHOD: 4 1/4" ID HSA

FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION
	GROUND SURFACE	14.3	
	ASPHALT	13.99	ASPHALT
	GRAVEL	13.79	BENTONITE SEAL
	ML-SILT (SLAG), dark brown, firm, sandy, little gravel/rubble, trace of coal, clay and wood, moist	9.79	CUTTINGS HOLEPLUG
	SP-SAND (FILL), dark brown, loose, little gravel/rubble, trace of clay, wood and slag, moist		
	- Little clay at 7.5ft BGS	4.79	
	SP-SAND, tan, fine to medium grained, trace coarse grained, medium dense, trace of wood, moist	3.29	
	END OF BOREHOLE @ 11.0ft BGS		

[1] CPM = Counts Per Minute

DEPTH ft BGS	SAMPLE NUMBER	'N' VALUE (REC ft)	CPM [1]
1			13483
2	01	8 (1.9)	20754
3			18605
4	02	4 (1.7)	15089
5			15540
6	03	6 (1.2)	12923
7			10993
8	04	2	9028
9			8543
10	05	25 (1.3)	6966
11			6476

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-38
DATE COMPLETED: April 19, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	14.4					
	ASPHALT	14.15	ASPHALT				
	GRAVEL	13.95					
	ML-SILT (FILL), dark brown, firm, sandy, little gravel/rubble, trace of slag, coal and wood, moist		BENTONITE SEAL				14199
2	- 3.5" rubble at 2.0ft BGS			S1		32 (0.9)	17529
							23158
4				S2		9 (0.2)	15928
	SP-SAND (FILL), dark brown, loose, little gravel/rubble, trace of clay, slag, coal, moist	10.15					
							13471
6			CUTTINGS HOLEPLUG	S3		2 (0.7)	13621
							12812
	- Little clay at 7.3ft BGS						
8				S4		2 (1.0)	10991
							8661
	SP-SAND, tan, fine grained, medium dense, trace of gravel, moist	4.95					
10				S5		15	7553
	END OF BOREHOLE @ 11.0ft BGS	3.45					6846
12							
14							

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-39
PROJECT NUMBER: 17770
DATE COMPLETED: April 19, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	13.9					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE	13.65	BENTONITE SEAL				
							15530
2				01		50+ (NR [2])	14654
	ML-SILT (FILL), dark brown, firm, sandy, some gravel/rubble, trace of slag, wood and coal, moist	11.45					
							16233
4				02		11 (NR [2])	12657
							9385
6	SC-SAND (FILL), dark brown, loose, little clay, trace of gravel/rubble and wood, moist to wet	8.15	CUTTINGS HOLEPLUG	03		6 (1.4)	9433
							9808
8	- Little clay at 7.5ft BGS			04		7 (NR [2])	8815
							7142
	SP-SAND, tan, fine to medium grained, trace coarse grained, medium dense, trace of gravel, moist	4.35					
10	SP-SAND, tan, fine to medium grained, trace coarse grained, medium dense, trace of gravel, moist			05		8 (1.0)	6706
	END OF BOREHOLE @ 11.0ft BGS	2.95					6396
12							
14							

[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-40
DATE COMPLETED: April 19, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM [1]
	GROUND SURFACE	14.2					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE	13.93	BENTONITE SEAL				
							45875
	ML-SILT (FILL), dark brown, firm, sandy, little gravel/rubble, trace of slag, wood and coal, moist	12.83					
2				[illegible]		8 (1.1)	162798
	SP-SAND (FILL), brown, loose, little clay and gravel/rubble, trace of slag and coal, moist	11.93					
							40910
4				[illegible]		12 (1.4)	15855
							9557
6			CUTTINGS HOLEPLUG	[illegible]		8 (1.5)	8122
							8476
8				[illegible]		6 (1.8)	8556
	- 4" grayish brown clay seam at 9.0ft BGS						11700
	SP-SAND, tan, dense, little gravel, moist	4.83					
10				[illegible]		30 (1.5)	8547
	END OF BOREHOLE @ 11.0ft BGS	3.23					7262
12	[1] CPM = Counts Per Minute						
14							

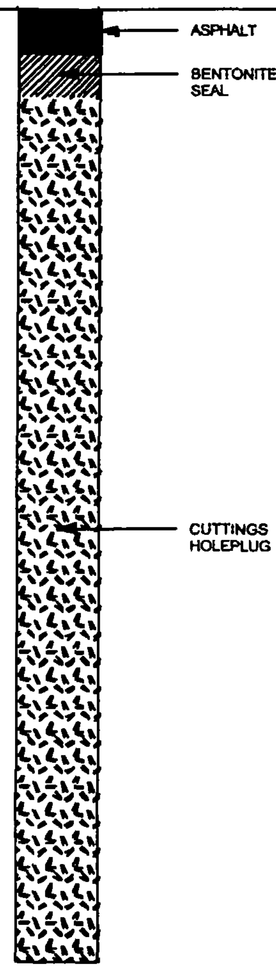
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ◯

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-41
PROJECT NUMBER: 17770
DATE COMPLETED: April 19, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	SAMPLE NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	14.2				
	ASPHALT					
	GRAVEL/RUBBLE SILT	13.69				
						16336
2	ML-SILT, dark brown, firm, sandy, little gravel/rubble, trace of slag and wood, moist	12.19	01		50+ (0.5)	13641
						11854
4			02		5 (1.7)	10495
	- Little clay and coal, moist to wet at 4.8ft BGS					10204
6			03		2 (1.6)	9171
						9510
8			04		10 (1.3)	10180
	- Rubble to 9.1' at 8.7ft BGS					10468
	SP-SAND, tan, fine to medium grained, medium dense, trace of gravel, moist	4.69				
10			05		18 (1.4)	7434
	END OF BOREHOLE @ 11.0ft BGS	3.19				
12						
14						



[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-42
DATE COMPLETED: April 18, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION
GROUND SURFACE	14.3	
ASPHALT	13.99	ASPHALT
GRAVEL/RUBBLE	13.79	BENTONITE SEAL
ML-SILT (FILL), dark brown, little clay, sand and gravel/rubble, moist	12.79	
GRAVEL/RUBBLE	11.09	
ML-SILT (FILL), dark brown, firm, sandy, little gravel/rubble, trace of coal and slag, moist	8.99	
SC-SAND (FILL), brown, loose, little clay and silt, trace of gravel and wood, moist	4.59	CUTTINGS HOLEPLUG
SP-SAND, tan, fine to medium grained, medium dense, trace of gravel, moist	3.29	
END OF BOREHOLE @ 11.0ft BGS		

[1] CPM = Counts Per Minute

SAMPLE

DEPTH ft BGS	NUMBER	'N' VALUE (REC ft)	CPM [1]
			18255
2	S1	50+ (0.7)	14856
			14704
4	S2	6 (0.8)	11418
			9854
6	S3	4 (1.7)	9161
			9884
8	S4	4 (0.4)	9109
			7858
10	S5	18 (1.3)	6336
			6682

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE. REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-43
PROJECT NUMBER: 17770
DATE COMPLETED: April 19, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION	SAMPLE NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM[1]
	GROUND SURFACE	14.2					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE	13.93	BENTONITE SEAL				
1							11766
2	SP-SAND (FILL), dark brown, medium grained, loose, little gravel/rubble and slag, dry	12.23					12760
3				01	2–4	4 (0.8)	17428
4							14331
	- Fine to medium grained, little clay and silt at 4.2ft BGS						
5				02	4–6	4 (1.5)	14020
6			CUTTINGS HOLEPLUG				14675
7				03	6–8	4 (1.0)	13084
	- Rubble at 7.5ft BGS						
8							8811
9				04	8–10	50+ (0.8)	6935
10							8199
11	END OF BOREHOLE @ 11.0ft BGS	3.23					6905

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG ACME.GPJ CRA_CORP.GDT 6/15/01

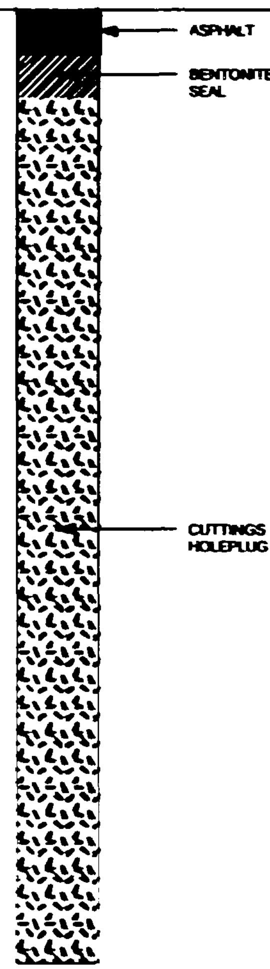
STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-44
DATE COMPLETED: April 19, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft
	GROUND SURFACE	14.2
	ASPHALT	13.91
	GRAVEL/RUBBLE/SILT	11.51
	SP-SAND (FILL), brown, fine grained, loose, little silt, trace of clay, slag and wood, moist	
	- Rubble at 5.5ft BGS	
	SP-SAND, tan, fine grained, medium dense, trace of gravel, moist	4.81
	END OF BOREHOLE @ 11.0ft BGS	3.21

BOREHOLE COMPLETION



SAMPLE NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
			15065
[illegible]		50+ (0.5)	12767
			16504
[illegible]		5 (1.0)	13684
			14517
[illegible]		6 (NR [2])	18801
			17134
[illegible]		9 (1.0)	12790
			10266
[illegible]		11 (1.8)	9003
			7374

[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

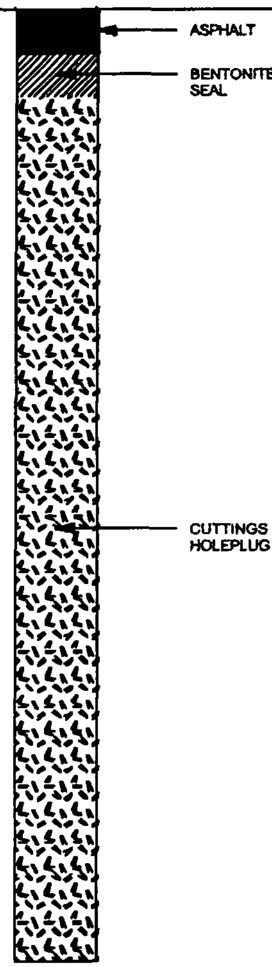
HOLE DESIGNATION: SB-45
DATE COMPLETED: April 19, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft
	GROUND SURFACE	13.6
	ASPHALT	
	GRAVEL	13.28
	ML-SILT (FILL), dark brown, firm, sandy, little gravel/rubble, trace of slag and coal, moist	11.88
	SP-SAND (FILL), dark brown, loose, little silt, trace of clay, slag and coal, moist	8.58
	SP-SAND, grayish brown, fine grained, loose, trace of gravel, moist	5.18
	END OF BOREHOLE @ 11.0ft BGS	2.58

[1] CPM = Counts Per Minute

[2] NR = No Recovery

BOREHOLE COMPLETION



DEPTH ft BGS	SAMPLE NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
1				12736
2				14733
3	01	2–4	5 (NR [2])	14372
4				11397
5	02	4–6	5 (NR [2])	14138
6				13492
7	03	6–8	6 (1.2)	10202
8				10711
9	04	8–10	9 (1.7)	9063
10				7657
11				6539

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-46
DATE COMPLETED: April 19, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	14.1					
	ASPHALT	13.81	ASPHALT				
	GRAVEL/RUBBLE	13.11	BENTONITE SEAL				
	ML-SILT (FILL), dark brown, sandy, some gravel/rubble, trace of slag, coal and wood, moist						15332
2	- Rubble to 3.0' at 1.9ft BGS			S1	X	50+ (NR [2])	14596
							17411
4	SP-SAND (FILL), dark brown, loose, little gravel/rubble, trace of slag and wood, moist	10.21		S2	X	9 (1.3)	19237
	- Little clay, reddish brown color at 4.9ft BGS						14582
6			CUTTINGS HOLEPLUG	S3	X	7 (1.6)	16063
	- No clay, dark brown at 6.8ft BGS						12582
8				S4	X	7 (1.5)	11756
	SP-SAND, grey, fine grained, medium dense, trace of gravel, petroleum odor	5.31					10336
10				S5	X	16	8086
	END OF BOREHOLE @ 11.0ft BGS	3.11					7609
12							
14							

[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ◯

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-47
PROJECT NUMBER: 17770
DATE COMPLETED: April 19, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	14					
	ASPHALT	13.69	ASPHALT				
	GRAVEL	13.49					
	SP-SAND (FILL), dark brown, fine to medium grained, medium dense, little gravel/rubble, trace of slag, moist		BENTONITE SEAL				15780
2				01		14 (1.3)	16144
	- Little clay at 2.7ft BGS						13104
	- No clay at 3.6ft BGS						
4				02		7 (1.5)	12158
							12346
6			CUTTINGS HOLEPLUG	03		5 (1.2)	14060
							15402
	- Little clay, trace of silt at 7.5ft BGS						
8				04		5 (1.7)	10933
							8984
	SP-SAND, gray, fine grained, medium dense, trace of gravel, moist, petroleum odor	4.59					
10				05		21 (1.2)	7433
	END OF BOREHOLE @ 11.0ft BGS	2.99					6899
	[1] CPM = Counts Per Minute						
12							
14							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG ACME.GPJ CRA_CORP.GDT 6/15/01

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-48
DATE COMPLETED: April 19, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft
	GROUND SURFACE	14.2
	ASPHALT	13.93
	GRAVEL	13.73
	SP-SAND (FILL), dark brown, loose, little silt, gravel/rubble, trace of slag, moist	
	- 3" layer of multiple colored clay, blue, brown, green, red, banded at 2.6ft BGS	
	SP-SAND (FILL), tan, fine grained, loose, trace gravel	7.73
	SC-SAND(FILL), brown, fine grained, loose, little clay, trace of gravel, moist, petroleum odor	7.03
10	SP-SAND, grayish brown, fine grained, trace of gravel, moist, petroleum odor	4.23
	END OF BOREHOLE @ 11.0ft BGS	3.23

BOREHOLE COMPLETION: ASPHALT; BENTONITE SEAL; CUTTINGS HOLEPLUG

SAMPLE

DEPTH ft BGS	NUMBER	'N' VALUE (REC ft)	CPM [1]
1			8230
2	S1	6 (1.0)	15417
3			17925
4	S2	11 (1.3)	12643
5			13060
6	S3	4 (1.3)	11031
7			9297
8	S4	3 (0.9)	10469
9			10186
10	S5	19 (1.3)	9271
11			9259

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

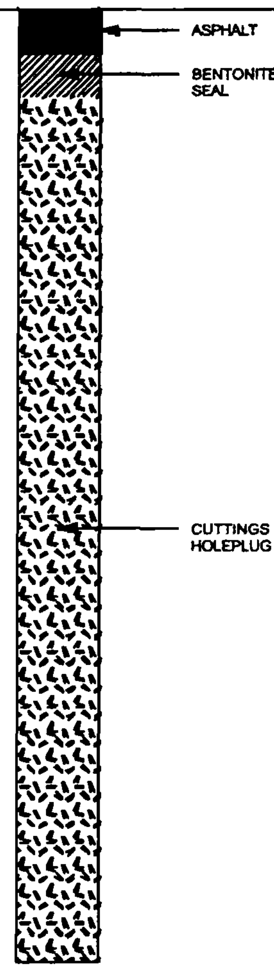
CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-49
DATE COMPLETED: April 20, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM [1]
	GROUND SURFACE	14					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE/SILT AND SAND	13.72	BENTONITE SEAL				15463
2				01		50+ (NR [2])	14766
	SP-SAND (FILL), dark brown, medium dense, little gravel/rubble, trace of clay, silt slag, coal and wood, moist	11.22					13382
4				02		12 (NR [2])	10339
							11715
	- No clay or silt at 5.6ft BGS						
6			CUTTINGS HOLEPLUG	03		12 (1.3)	13640
	- Little clay at 7.2ft BGS						10094
8				04		10 (0.8)	9508
							9480
	SP-SAND, gray, fine grained, medium dense, trace of gravel, moist, petroleum odor	4.72					
10				05		10 (1.4)	7815
	END OF BOREHOLE @ 11.0ft BGS	3.02					6689
12							
14							



[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: *MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE*

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-50
PROJECT NUMBER: 17770
DATE COMPLETED: April 20, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

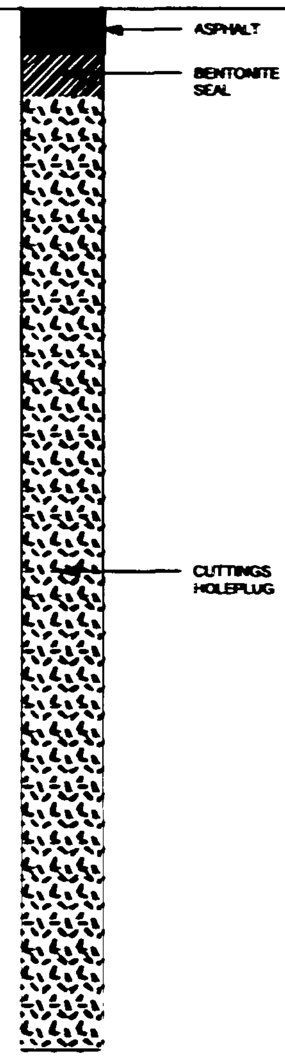
DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM [1]
	GROUND SURFACE	14.2				
	ASPHALT	13.86				
	GRAVEL	13.66				
	ML-SILT (FILL), dark brown, firm, sandy, some gravel/rubble, trace of slag and coal, moist					17833
2						14522
			[illegible]	X	9 (NR [2])	12459
4	SP-SAND (FILL), brown, loose, trace gravel/rubble and clay, moist	10.36				13692
	- Some gravel/rubble, little slag, no clay, dark brown at 5.1ft BGS		[illegible]	X	5 (1.1)	14231
6						10952
	- Little clay, trace of gravel/rubble, no slag, trace of wood at 6.3ft BGS		[illegible]	X	5 (1.4)	9697
8						9357
	- Gravel/rubble with trace of slag to 9.4' at 8.8ft BGS		[illegible]	X	5 (1.1)	8612
10	SC-SAND (FILL), gray, fine grained, medium dense, trace of gravel, moist	4.36				7304
			[illegible]	X	7 (1.6)	6863
12	SP-SAND, gray, fine grained, medium dense, trace of gravel, moist	2.46				
		2.16				
14						

END OF BOREHOLE @ 12.0ft BGS

[1] CPM = Counts Per Minute

[2] NR = No Recovery

BOREHOLE COMPLETION



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

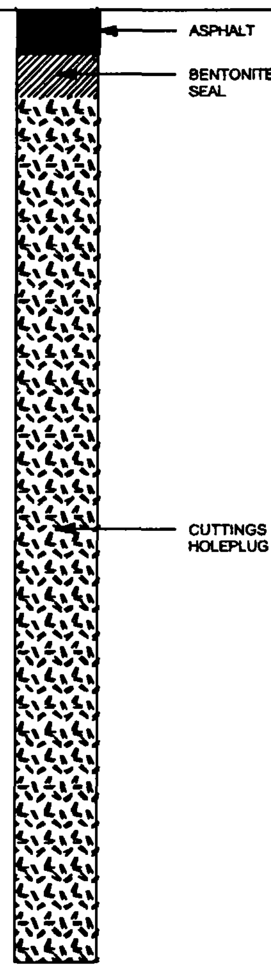
CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-51
PROJECT NUMBER: 17770
DATE COMPLETED: April 20, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft
	GROUND SURFACE	14.1
	ASPHALT	
	GRAVEL/RUBBLE/SILT AND SAND	13.78
	SP-SAND (FILL), dark brown, loose, some gravel/rubble, little slag, coal and clay, trace of wood, moist	10.58
	SP-SAND, tan, fine grained, medium dense, trace of gravel, moist	3.98
	END OF BOREHOLE @ 11.0ft BGS	3.08

BOREHOLE COMPLETION



SAMPLE

NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
			16505
			14910
			17767
01	X	5 (NR [2])	12572
			10522
02	X	3 (NR [2])	10234
			10410
03	X	2 (0.4)	7382
			7889
04	X	10 (1.0)	6510
			6670

Depth scale: 2, 4, 6, 8, 10, 12, 14

[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG ACME.GPJ CRA_CORP.GDT 6/15/01

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-52
DATE COMPLETED: April 20, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM [1]
	GROUND SURFACE	14.3					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE/SILT AND SAND	13.98	BENTONITE SEAL				15314
2	SP-SAND (FILL), dark brown, medium dense, little gravel/rubble and clay, trace of silt, slag, coal and wood, moist	12.58					17613
				S1	2–4	14 (1.3)	11957
4							9526
	- Trace of gravel/rubble and clay, no slag or coal at 4.2ft BGS			S2	4–6	6 (1.3)	8312
6			CUTTINGS HOLEPLUG				9140
				S3	6–8	5 (1.6)	9878
8	- Little silt and clay, no slag or coal at 7.3ft BGS						8206
				S4	8–10	35 (1.3)	8334
	SP-SAND, tan, fine grained, trace medium to coarse grained, dense, trace of gravel, moist	4.98					
10							7113
	END OF BOREHOLE @ 11.0ft BGS	3.28					6896
12							
14							

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG ACME (3P) CRA_COMP.GDT 8/1/01

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO

PROJECT NUMBER: 17770

CLIENT: DRAPER & KRAMER

LOCATION: CHICAGO, ILLINOIS

CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-53

DATE COMPLETED: April 20, 2001

DRILLING METHOD: 4 1/4" ID HSA

FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM [1]
	GROUND SURFACE	14.2					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE/SILT AND SAND	13.89	BENTONITE SEAL				14544
2	SP-SAND (FILL), dark brown, loose, little gravel/rubble, trace of clay, silt slag, coal and wood, moist	12.19		01		50+ (0.4)	16631
	- Trace gravel/rubble at 3.0ft BGS						13230
4				02		14 (1.6)	10416
							8812
6			CUTTINGS HOLEPLUG	03		5 (1.0)	9245
							11879
8				04		14 (1.3)	8677
							8253
	SP-SAND, tan, fine grained, trace medium to coarse grained, trace of gravel, moist	4.79					
10				05		20 (1.5)	6993
	END OF BOREHOLE @ 11.0ft BGS	3.19					6674
12	[1] CPM = Counts Per Minute						
14							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG ACME.GPJ CRA_CORP.GDT 6/15/01

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-54
DATE COMPLETED: April 20, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM [1]
	GROUND SURFACE	13.9				
	ASPHALT		ASPHALT			
	GRAVEL/RUBBLE	13.64	BENTONITE SEAL			
	SP-SAND (FILL), dark brown, medium dense, little gravel/rubble and slag, trace of clay, silt slag, coal and wood, moist	12.94				14416
2				[illegible]	11 (1.3)	18044
	- Rubble at 3.0ft BGS					13193
4				[illegible]	4 (NR [2])	10270
	- Trace of gravel/rubble, slag and little silt and clay at 5.0ft BGS					8729
6			CUTTINGS HOLEPLUG	[illegible]	4 (1.0)	7467
						10222
	- Rubble at 7.4ft BGS					
8				[illegible]	10 (NR [2])	7982
						7082
	SP-SAND, tan, fine grained, trace medium and coarse grained, trace of gravel, moist	4.54				
10				[illegible]	20 (1.2)	6680
	END OF BOREHOLE @ 11.0ft BGS	2.94				6666

[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-55
DATE COMPLETED: April 20, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM [1]
	GROUND SURFACE	13.9					
	ASPHALT		ASPHALT				
	GRAVEL/RUBBLE, SAND AND SILT	13.61	BENTONITE SEAL				18087
	- Rubble at 1.5ft BGS						
2				01		14 (1.0)	20087
							19261
	SP-SAND (FILL), dark brown, loose, some rubble, trace of slag, wood, clay and silt, moist	10.71					
4				02		9 (0.7)	13866
	- Little silt and clay, trace of gravel and rubble at 5.0ft BGS						12523
6			CUTTINGS HOLEPLUG	03		4 (1.2)	9994
							11364
8				04		6 (0.3)	9570
							7828
10	SP-SAND, tan, fine grained, trace medium and coarse grained, dense, trace of gravel, moist	3.91		05		31 (0.3)	6802
	END OF BOREHOLE @ 11.0ft BGS	2.91					7114
12							
14							

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ◯

OVERBURDEN LOG ACME.GPJ CRA_CORP.GDT 6/15/01

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
PROJECT NUMBER: 17770
CLIENT: DRAPER & KRAMER
LOCATION: CHICAGO, ILLINOIS
CONTRACTOR: MID-AMERICA DRILLING

HOLE DESIGNATION: SB-56
DATE COMPLETED: April 20, 2001
DRILLING METHOD: 4 1/4" ID HSA
FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM [1]
	GROUND SURFACE	13.7					
	ASPHALT	13.37	ASPHALT				
	GRAVEL	13.17	BENTONITE SEAL				
	SP-SAND (FILL), dark brown, medium dense, little gravel/rubble and slag, trace of silt						19280
2				[illegible]		15 (1.0)	19627
	- Little silt and clay, trace rubble and slag at 3.0ft BGS						15855
4				[illegible]		7 (1.4)	12019
							11834
6			CUTTINGS HOLEPLUG	[illegible]		8 (1.7)	8960
							8823
8				[illegible]		6 (1.0)	9497
							8085
	SP-SAND, grayish brown, fine grained, medium dense, trace of gravel, moist, petroleum odor	4.17					
10				[illegible]		15 (1.5)	6949
	END OF BOREHOLE @ 11.0ft BGS	2.67					6800
12							
14							

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-57
PROJECT NUMBER: 17770
DATE COMPLETED: April 20, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	BOREHOLE COMPLETION	SAMPLE NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	14.1					
	ASPHALT	13.78	ASPHALT				
	GRAVEL/RUBBLE	13.58	BENTONITE SEAL				
	SP-SAND (FILL), dark brown, fine to medium grained, loose, some gravel/rubble, little silt and slag, moist						15773
2				01	X	7 (1.3)	15031
							17271
4				02	X	6 (1.2)	12885
							9707
6			CUTTINGS HOLEPLUG	03	X	6 (1.3)	9977
	- Little silt and clay, trace of gravel/rubble and slag at 6.5ft BGS						11056
8				04	X	13 (1.2)	9070
							8591
	SP-SAND, gray, fine grained, trace of gravel, petroleum odor	4.58					
10				05	X	27 (1.0)	7705
	END OF BOREHOLE @ 11.0ft BGS	3.08					6870
12							
14							

[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO

PROJECT NUMBER: 17770

CLIENT: DRAPER & KRAMER

LOCATION: CHICAGO, ILLINOIS

CONTRACTOR: MID-AMERICA DRILLING

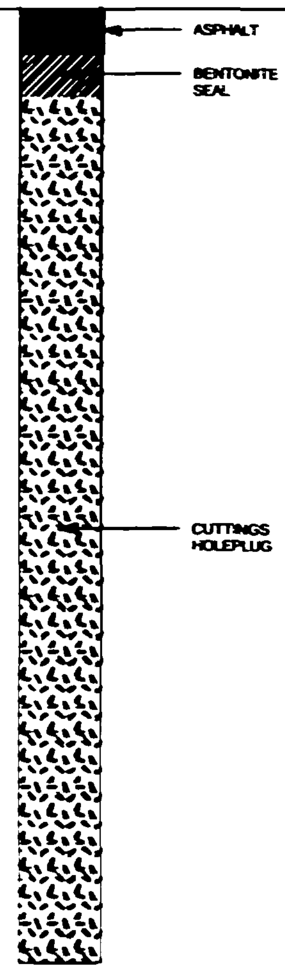
HOLE DESIGNATION: SB-58

DATE COMPLETED: April 20, 2001

DRILLING METHOD: 4 1/4" ID HSA

FIELD PERSONNEL: W. POCHRON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV ft	BOREHOLE COMPLETION	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE 'N' VALUE (REC ft)	SAMPLE CPM[1]
	GROUND SURFACE	13.7					
	ASPHALT						
	GRAVEL/RUBBLE	13.4					
	SP-SAND (FILL), dark brown, medium dense, little clay gravel/rubble, trace of slag and wood, moist	12.7					12759
2				[illegible]		12 (1.4)	13544
							12835
4				[illegible]		10 (0.9)	14540
							11591
	- No slag or wood, brown at 5.5ft BGS						
6				[illegible]		7 (0.8)	14061
							9828
8				[illegible]		5 (NR[2])	9818
							7533
	SP-SAND, tan, fine grained, trace medium and coarse grained, medium dense, trace of gravel, moist	4.5					
10				[illegible]		14 (1.5)	6813
							6921
	END OF BOREHOLE @ 11.0ft BGS	2.7					
12							
14							



[1] CPM = Counts Per Minute

[2] NR = No Recovery

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE, REFER TO CURRENT ELEVATION TABLE

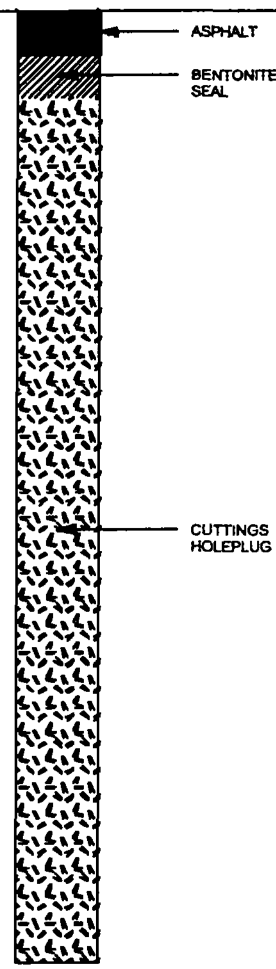
CHEMICAL ANALYSIS

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: FAIRBANKS & OHIO
HOLE DESIGNATION: SB-59
PROJECT NUMBER: 17770
DATE COMPLETED: April 20, 2001
CLIENT: DRAPER & KRAMER
DRILLING METHOD: 4 1/4" ID HSA
LOCATION: CHICAGO, ILLINOIS
FIELD PERSONNEL: W. POCHRON
CONTRACTOR: MID-AMERICA DRILLING

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	SAMPLE NUMBER	INTERVAL	'N' VALUE (REC ft)	CPM [1]
	GROUND SURFACE	13.7				
	ASPHALT	13.42				
	GRAVEL/RUBBLE					15289
2						15751
	SP-SAND (FILL), dark brown, fine grained, medium dense, loose, little clay and gravel/rubble, trace of slag and coal, moist	10.72				13136
4			01	X	11 (1.2)	14201
						14831
	- Trace of clay at 5.2ft BGS					
6			02	X	7 (1.0)	11244
	- Trace of gravel/rubble, little clay and silt, moist to wet at 6.8ft BGS					9676
8			03	X	11 (1.8)	12241
						8962
10			04	X	25	6773
	END OF BOREHOLE @ 11.0ft BGS	2.72				7062
12						
14						

BOREHOLE COMPLETION



[1] CPM = Counts Per Minute

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

ATTACHMENT B

RSSI REPORT

SURVEY ACTIVITIES
AT 247 EAST ILLINOIS STREET
CHICAGO, ILLINOIS
PERFORMED ON
FEBRUARY 9, AND APRIL 16-20, 2001

FOR

CONESTOGA-ROVERS & ASSOCIATES
8615 W. BRYN MAWR AVENUE
CHICAGO, IL 60631-3501

BY

RSSI
6312 W. OAKTON STREET
MORTON GROVE, ILLINOIS 60053-2723

May 7, 2001

I. METHODOLOGY

Surface radiation level survey

On February 9, RSSI performed a walkover survey of the site. The survey area was an asphalt-covered parking lot with three small buildings located at the edges of the lot. Above-ground radiation level measurements were performed by passing a side shielded 2 inch by 2 inch thallium doped sodium iodide (NaI(Tl)) detector over the survey area.

The detector was positioned about 3 inches from the ground surface during the survey. The detector was connected to a Ludlum 193 ratemeter (serial number 149080.) Measurements were recorded in the intersection of every approximate nine-foot grid node. An RSSI employee took measurements and a Conestoga-Rovers & Associates (CRA) employee recorded the data.

Down-hole Measurements

To further evaluate and support the conclusions derived from the walkover survey data, down-hole radiation levels were measured and gamma spectroscopy analyses were performed on samples collected by CRA.

On February 9, 2001, down-hole measurements of subsurface radiation levels were performed at two locations selected by CRA in the vicinity of elevated surface radiation levels.

On April 16-20, 2001, down-hole measurements of subsurface radiation levels were performed at 59 locations selected by CRA. See site plan, Appendix A. All measurements were performed using a Ludlum Model 2241 survey meter, serial number 116442, equipped with a 1" x 1" NaI(Tl) probe on February 9, and with a 2" x 2" NaI probe on April 16-20.

Soil Analysis

On February 9, three soil samples were collected from one bore-hole located in the vicinity of the highest surface radiation levels. 59 samples were collected between April 16-20. For each sample, a 500 ml Marinelli beaker was filled with soil collected by CRA personnel. All samples were counted for 1 hour on a high-resolution gamma spectroscopy system.

The samples were analyzed using GDR software for the uranium, thorium and actinium series and potassium-40. Radium 228 from the thorium series emits no significant photons. Radium 226 from the uranium series has only one significant photon at 186 keV and its abundance is slightly greater than 0.03. These properties make identification of these isotopes of radium unlikely in practical situations.

The concentrations of surrogates with more abundant high energy photons usually represent the concentration of Ra-228 and Ra-226. Actinium-228, in the thorium series, is frequently used as a surrogate for Radium-228, and Lead-214, in the uranium series, is frequently used as a surrogate for Radium-226. These surrogates are in equilibrium with the radium isotopes after one month in situ.

II. RESULTS

Surface radiation level survey results

The background radiation level with the Ludlum 193 and the 2-inch by 2-inch sodium iodide detector was 2,000 counts per minute (cpm). Several areas on the site had radiation levels significantly above background. The most elevated areas were along the western edge of the property. The highest reading was 8,500 cpm, measured between areas D13 and E13. The measurement was approximately 41 feet from the south sidewalk and approximately 19 feet from the brick wall.

Down-hole Results

The February 9, down-hole measurements were made with the 1-inch by 1-inch detector and the Ludlum 2241 at two locations, B3 and G8. The results of these measurements are summarized in Table 2 of a report dated February 19, 2001, and are incorporated in this report in Appendix B. Bore-hole G8 readings could not be made at the surface and one and two foot depths because a heavy rain interfered with equipment performance.

The results from the April 16-20 down-hole measurements are in Appendix B. The highest reading, 2,239,317 cpm, was recorded in the bore-hole designated SB-11 at a depth of 2 ft.

Soil Analysis Results

The high-resolution gamma spectroscopy analyses of the boring samples are provided in Appendix C. Ac-228 and Pb-214 are surrogates for Ra-228 and Ra-226, respectively. The highest concentration of Ac-228 plus Pb-214 was 2500 pCi/g in a sample collected from bore-hole SB11. The sample was collected from a depth of approximately 1 ft-3 ft. This concentration represents the sum of concentrations of Ra-228 and Ra-226.

Several parameters are set in the GDR software before analysis. Sensitivity discriminates against statistically poor peaks. The lower the search sensitivity, the smaller and less defined the peak can be and still be recognized. The range for sensitivity is from 0 to 10. The manufacturer's default value of 2 was used. Low energy cutoff sets the value below which energies will not be considered in the peak search routine. The low energy cutoff was set to 30 keV. The library window is the tolerance in keV used to determine if a peak energy is a close enough match to a library energy to identify the peak for activity reporting. The manufacturer's default value of 2 keV was used. The final parameter is the gamma fraction limit (%). This value, ranging from 0 to 100, sets the specified fraction of known secondary peaks that must be present in the spectrum. The gamma fraction limit was set to 10%. The efficiency and library files used in the analysis are in Appendix D.

III. CONCLUSIONS

The results of the surface survey show evidence of concentrations of radioactivity above normal background levels at a number of locations. This conclusion is supported by down-hole measurements, which are significantly elevated above levels usually attributed to naturally occurring radioactive material or rubble in the soil.

The EPA has applied an action level in the Streeterville area of a total of 7.1 pCi/g Ra-226 plus Ra-228. Eight samples out of 59 samples had concentrations of radium-226 and radium-228 surrogates in excess of the EPA's action level of 7.1 pCi/g.

APPENDIX A

SITE PLAN AND BORING LOCATIONS

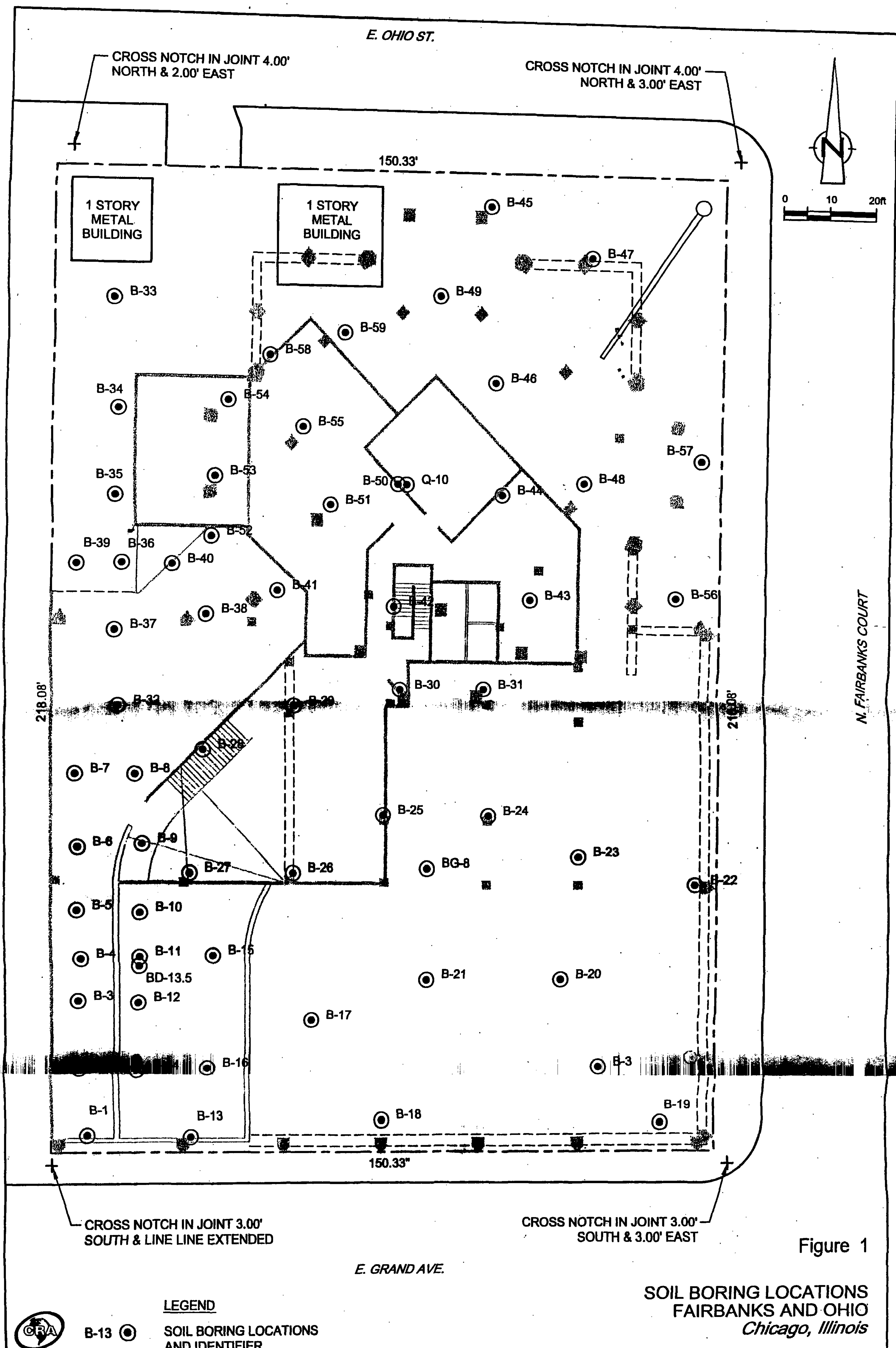


Figure 1

SOIL BORING LOCATIONS
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(OCON006)GN-CO001 JUN 06/2001

APPENDIX B

Note: Bolded values represent the highest recorded radiation reading in each bore-hole.

Down Hole Measurement Results Reported February 19, 2001

Depth	Hole B3 (cts in 1 min)	Hole G8 (cts in 1 min)
1 ft	4019	-
2 ft	**4576**	-
3 ft	3504	3948
4 ft	3487	3484
5 ft	2418	2523
6 ft	2070	2421
7 ft	1946	2285
8 ft	2020	1769
9 ft	1924	1692
10 ft	1513	1633
11 ft	1667	1599

APPENDIX B (continued)

Down Hole Results Recorded April 16-20, 2001												
		Location										
		SB-1	SB-2	SB-3	SB-4	SB-5	SB-6	SB-7	SB-8	SB-9	SB-10	SB-11
Depth (ft)	1	34306	32353	12623	52227	12565	16802	7357	21956	31191	24367	941777
	2	39369	33106	21075	62398	24512	21123	7481	37489	64713	49852	**2239317**
	3	43093	48314	39598	123342	44487	24606	9035	55734	134766	46746	795526
	4	**43320**	58074	50991	205457	85002	29305	14716	**63107**	155701	42602	255023
	5	40756	**65846**	**58707**	582566	175580	37178	34919	62741	246111	**58245**	140670
	6	29608	60149	52387	**1392437**	**385457**	**47586**	**73990**	51494	**270978**	47299	89164
	7	18984	38141	21881	857261	154910	41328	63495	36237	63831	19581	23662
	8	10398	17925	13615	165056	44667	29322	34866	-	21382	12704	12184
	9	8734	10316	9738	36098	27822	16391	22111	12417	10802	9005	9230
	10	8150	8977	9034	15549	18691	12947	14222	9605	7870	7748	10381
	11	8613	8671	8391	12639	16584	12748	12926	11742	8900	7756	36590
	12	10245	10818	8483	27936	16486	9377	12890	9518	9673	6896	8968
	13	7930	9451	7172	12549	10928	8079	10176	6611	6542	6617	57181

APPENDIX B (continued)

		Location											
		SB-12	SB-13	SB-14	SB-15	SB-16	SB-17	SB-18	SB-19	SB-20	SB-21	SB-22	SB-23
Depth (ft)	1	39052	31221	114356	15211	**14261**	15412	**17901**	**17437**	**14391**	**16463**	**17502**	**12944**
	2	64254	**49254**	**234427**	**17849**	14256	**18056**	11055	12980	13765	11886	16048	12324
	3	71867	45202	132254	17689	14168	14969	10781	10095	12467	11114	12340	10980
	4	98919	45565	106418	16963	12808	9802	9782	15412	9569	11729	9986	11047
	5	**106794**	44411	105137	13589	11629	9373	9411	12127	8302	10175	10474	10038
	6	66487	38341	69261	11048	9552	8271	9248	8279	8666	9159	8292	8915
	7	25362	13855	25748	9465	6278	6938	10435	8625	8108	9287	8057	8409
	8	11113	-	11388	8557	6051	7095	13437	8012	7670	8730	8876	7889
	9	8984	9207	9355	7092	6652	6781	7566	6738	8033	6668	7740	8714
	10	10524	9750	17621	6636	6309	6578	6925	6713	7083	6654	6914	7405
	11	6878	-	7865	6974	6115	6458	6444	6343	6756	6431	7009	6554
	12	-	-	-	-	-	-	-	-	-	-	-	-
	13	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX B (continued)

		Location											
		SB-24	SB-25	SB-26	SB-27	SB-28	SB-29	SB-30	SB-31	SB-32	SB-33	SB-34	SB-35
Depth(ft)	1	11209	11664	13972	16475	**19930**	15907	**17025**	**14897**	17591	15214	16108	**16588**
	2	**14738**	**17365**	**18521**	25449	18514	15915	12385	12870	21580	**16967**	**21146**	13816
	3	14565	15296	14194	**34238**	19654	**15946**	11046	11277	**22348**	15856	15156	13474
	4	10705	12529	11191	32080	18733	13715	11565	10515	22102	14300	15912	12351
	5	10345	11955	7472	24951	16681	12907	12165	10600	22263	14341	10544	8130
	6	12017	11484	8602	17658	15071	11733	15661	9580	20585	14007	10420	9073
	7	10206	9398	8677	14420	7349	10365	10524	10977	12722	-	9591	10175
	8	7947	8584	8061	9696	5645	9610	8879	13028	5917	10497	9800	8563
	9	7739	7290	7813	7417	6898	8559	7044	8494	6280	7584	8612	7844
	10	6598	6712	7316	7116	6535	8619	6882	6700	7281	7034	7163	6709
	11	6539	6968	6669	6640	6432	6885	6739	6402	6787	6789	6311	6459
	12	-	-	-	-	-	-	-	-	-	-	-	-
	13	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX B (continued)

		Location											
		SB-36	SB-37	SB-38	SB-39	SB-40	SB-41	SB-42	SB-43	SB-44	SB-45	SB-46	SB-47
Depth (ft)	1	24138	13483	14199	15530	45875	**16336**	**18255**	11766	15065	12736	15332	15780
	2	**62638**	**20754**	17529	14654	**162798**	13641	14856	12760	12767	**14733**	14596	**16144**
	3	16076	18605	**23158**	**16233**	40910	11854	14704	**17428**	16504	14372	17411	13104
	4	14040	15089	15928	12657	15655	10495	11418	14331	13684	11397	19237	12156
	5	8338	15540	13471	9385	9557	10204	9654	14020	14517	14138	14582	12346
	6	9878	12923	13621	9433	8122	9171	9161	14675	**18901**	13492	**16083**	14060
	7	8975	10993	12812	9608	8476	9510	9884	13084	17134	10202	12582	15402
	8	8798	9028	10991	8815	8556	10160	9109	8811	12790	10711	11756	10933
	9	10454	8543	8661	7142	11700	10468	7658	6935	10288	9063	10338	8984
	10	7861	6968	7553	6708	8547	7434	6336	8199	9003	7657	8086	7433
	11	6704	6476	6846	6396	7262	-	6882	6905	7374	6539	7609	6899
	12	-	-	-	-	-	-	-	-	-	-	-	-
	13	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX B (continued)

		Location											
		SB-48	SB-49	SB-50	SB-51	SB-52	SB-53	SB-54	SB-55	SB-56	SB-57	SB-58	SB-59
Depth (ft)	1	8230	**15463**	**17833**	16505	15314	14544	14416	18087	19280	15773	12759	15289
	2	15417	14766	14522	14910	**17613**	**16631**	**18044**	**20087**	**19627**	15031	13544	**15751**
	3	**17925**	13382	12459	**17767**	11967	13230	13193	19281	15655	**17271**	12835	13136
	4	12643	10339	13692	12572	9626	10416	10270	13886	12019	12885	**14540**	14201
	5	13060	11715	14231	10522	8312	8812	8729	12523	11834	9707	11591	14831
	6	11031	13640	10952	10234	9140	9245	7467	9994	8960	9977	14061	11244
	7	9297	10094	9597	10410	9678	11879	10222	11364	8823	11056	9828	9676
	8	10469	9508	9357	7382	8206	8877	7982	9570	9497	9070	9818	12241
	9	10186	9480	8812	7889	8334	8253	7082	7828	8085	8591	7533	8962
	10	9271	7815	7304	6510	7113	6993	6660	6802	6949	7705	6813	6773
	11	9259	6689	6963	6670	6896	6674	6566	7114	6800	6870	6921	7082
	12	-	-	-	-	-	-	-	-	-	-	-	-
	13	-	-	-	-	-	-	-	-	-	-	-	-

H:\home\400001\crs\downhole.doc

APPENDIX C

Gamma Spectroscopy Results

Sample NO.	Borehole ID	Depth ft	Ac-228 pCi/g	Pb-214 pCi/g	TOTAL pCi/g
011294	SB-1	1-3	0.00E+00	2.00E+00	2.00E+00
011295	SB-1	7-9	0.00E+00	3.00E+00	3.00E+00
011296	SB-2	1-3	0.00E+00	1.56E+00	1.56E+00
011297	SB-2	5-7	1.80E+00	2.54E+00	4.34E+00
011299	SB-3	3-5	7.29E-01	1.36E+00	2.09E+00
011300	SB-3	7-9	2.97E-01	4.60E-01	7.57E-01
011301	SB-4	1-3	1.06E+00	2.13E+00	3.19E+00
011303	**SB-4**	**5-7**	**1.07E+02**	**3.58E+01**	**1.43E+02**
011302	SB-4	9-11	9.46E-01	7.92E-01	1.74E+00
011304	SB-5	5-7	2.56E+00	4.47E+00	7.03E+00
011305	SB-5	9-11	0.00E+00	6.87E-01	6.87E-01
011306	SB-6	1-3	0.00E+00	1.46E+00	1.46E+00
011307	SB-6	5-7	9.19E-01	2.73E+00	3.65E+00
011308	SB-7	7-9	4.74E-01	1.25E+00	1.72E+00
011309	SB-8	1-3	1.69E+00	3.24E+00	4.93E+00
011310	SB-8	7-9	0.00E+00	1.91E+00	1.91E+00
011311	SB-9	1-3	1.95E+00	2.92E+00	4.87E+00
011312	**SB-9**	**5-7**	**9.08E+01**	**4.94E+01**	**1.40E+02**
011313	SB-10	3-5	9.97E-01	1.19E+00	2.19E+00
011314	SB-10	7-9	0.00E+00	7.97E-01	7.97E-01
011315	**SB-11**	**1-3**	**1.21E+03**	**1.29E+03**	**2.50E+03**
011316	**SB-11**	**7-9**	**6.92E+00**	**2.27E+00**	**9.19E+00**
011317	SB-11	9-11	1.56E+00	4.67E-01	2.03E+00
011318	SB-12	1-3	1.13E+00	1.59E+00	2.72E+00
011319	**SB-12**	**3-5**	**2.38E+00**	**5.72E+00**	**8.10E+00**
011320	SB-13	3-5	1.94E+00	2.22E+00	4.16E+00
011321	**SB-14**	**1-3**	**5.17E+01**	**9.68E+00**	**6.14E+01**
011322	**SB-14**	**3-5**	**7.35E+00**	**1.77E+00**	**9.12E+00**
011323	SB-15	1-3	1.33E+00	1.24E+00	2.57E+00
011325	SB-16	3-5	4.91E-01	5.17E-01	1.01E+00
011326	SB-17	3-5	4.69E-01	6.68E-01	1.14E+00
011327	SB-18	1-3	0.00E+00	1.02E+00	1.02E+00
011328	SB-19	3-5	1.22E+00	1.61E+00	2.83E+00
011329	SB-20	3-5	4.41E-01	5.63E-01	1.00E+00
011330	SB-21	3-5	5.94E-01	6.22E-01	1.22E+00
011331	SB-22	3-5	0.00E+00	9.19E-01	9.19E-01
011332	SB-23	1-3	6.63E-01	9.55E-01	1.62E+00
011333	SB-24	1-3	7.40E-01	1.00E+00	1.74E+00
011334	SB-24	5-7	0.00E+00	6.29E-01	6.29E-01
011335	SB-25	2-4	6.84E-01	1.10E+00	1.78E+00
011336	SB-26	2'-4'	9.25E-01	2.09E+00	3.02E+00
011337	SB-26	4'-6'	0.00E+00	1.08E+00	1.08E+00
011338	SB-27	2'-4'	1.81E+00	3.27E+00	5.08E+00
011339	SB-27	4'-6'	1.54E+00	3.24E+00	4.78E+00
011340	SB-27	8'-10'	4.77E-01	8.98E-01	1.38E+00
011341	SB-28	1'-3'	8.91E-01	2.47E+00	3.36E+00

011342	SB-28	7'-9'	0.00E+00	1.19E+00	1.19E+00
011343	SB-29	1'-3'	7.38E-01	1.18E+00	1.92E+00
011344	SB-29	5'-7'	0.00E+00	1.56E+00	1.56E+00
011386	SB-30	1'-3'	9.76E-01	1.85E+00	2.83E+00
011387	SB-30	5'-7'	4.41E-01	1.15E+00	1.59E+00
011388	SB-31	1'-3'	9.52E-01	2.22E+00	3.17E+00
011389	SB-31	7'-9'	7.27E-01	1.23E+00	1.96E+00
011390	SB-33	1'-3'	1.02E+00	2.61E+00	3.63E+00
011391	SB-33	5'-7'	0.00E+00	1.68E+00	1.68E+00
011392	SB-34	1'-3'	9.57E-01	2.81E+00	3.77E+00
011393	SB-34	5'-7'	0.00E+00	1.38E+00	1.38E+00
011394	SB-35	1'-3'	0.00E+00	1.36E+00	1.36E+00
011395	SB-35	3'-5'	9.31E-01	2.24E+00	3.17E+00
011396	SB-36	1'-3'	0.00E+00	2.59E+00	2.59E+00
011397	SB-36	5'-7'	0.00E+00	8.80E-01	8.80E-01
011398	SB-37	1'-3'	1.83E+00	3.50E+00	5.33E+00
011399	SB-37	3'-5'	6.76E-01	1.97E+00	2.65E+00
011400	SB-38	1'-3'	9.04E-01	2.81E+00	3.71E+00
011401	SB-38	5'-7'	0.00E+00	1.96E+00	1.96E+00
011402	SB-39	5'-7'	5.11E-01	1.17E+00	1.68E+00
011403	**SB-40**	**1'-3'**	**1.54E+01**	**1.09E+01**	**2.63E+01**
011404	SB-40	3'-5'	4.78E-01	1.62E+00	2.10E+00
011405	SB-41	1'-3'	8.74E-01	2.26E+00	3.13E+00
011406	SB-42	1'-3'	7.48E-01	2.25E+00	3.00E+00
011407	SB-43	3'-5'	5.56E-01	1.08E+00	1.64E+00
011408	SB-44	3'-5'	7.09E-01	2.44E+00	3.15E+00
011409	SB-45	6'-8'	0.00E+00	1.05E+00	1.05E+00
011410	SB-46	3'-5	7.68E-01	2.60E+00	3.37E+00
011411	SB-47	1'-3'	9.51E-01	2.08E+00	3.03E+00
011412	SB-48	3'-5'	1.17E+00	1.91E+00	3.08E+00
011413	SB-49	5'-7'	6.07E-01	1.23E+00	1.84E+00
011414	SB-50	4'-6'	9.00E-01	2.41E+00	3.31E+00
011415	SB-52	2'-4'	5.36E-01	1.64E+00	2.18E+00
011416	SB-53	1'-3'	0.00E+00	2.39E+00	2.39E+00
011417	SB-53	7'-9'	0.00E+00	1.55E+00	1.55E+00
011418	SB-54	1'-3'	8.56E-01	3.53E+00	4.39E+00
011419	SB-54	5'-7'	0.00E+00	1.11E+00	1.11E+00
011420	SB-55	1'-3'	8.37E-01	3.04E+00	3.88E+00
011421	SB-55	5'-7'	0.00E+00	9.93E-01	9.93E-01
011422	SB-56	1'-3'	1.49E+00	2.89E+00	4.38E+00
011423	SB-57	1'-3'	7.00E-01	1.99E+00	2.69E+00
011424	SB-58	3'-5'	1.03E+00	2.01E+00	3.04E+00
011425	SB-59	3'-5'	0.00E+00	9.70E-01	9.70E-01
011426	B3	1'-3'	6.04E-01	2.50E+00	3.10E+00
011427	G8	1'-3'	6.59E-01	3.32E+00	3.98E+00

* Bolded Values exceed 7.1 pCi/g

APPENDIX D

Efficiency and Library Files Used in Gamma Spec Analysis

EFFICIENCY FILE: h:\gdr\eff\500mar.eff
ID.: 500 ml Marinelli

Eff.=1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]

(Where En = Energy in MeV)

Library file: h:\gdr\lib\UThAcK.lib
ID.: U, Th, & Ac Natural Series + K

Pk. #	Energy (keV)	Isotope Name	2ndary Pk #	Type	Gamma Fraction	Halflife		DAC (uCi/ml)	Calc Cntr	Sbtr Cntr
1	11.70	Ra-223	19	I.D.	0.2474	1.1434e+001	D	3.0e-010	Y	Y
2	12.30	Fr-223	7	I.D.	0.3368	2.1800e+001	M	3.0e-007	Y	Y
3	13.00	U-235	25	I.D.	0.3910	7.0380e+008	Y	2.0e-011	Y	Y
4	27.36	Pa-231	26	QUANT	0.0930	3.2760e+004	Y	6.0e-013	Y	Y
5	46.50	Pb-210	0	QUANT	0.0405	2.2260e+001	Y	1.0e-010	Y	Y
6	50.10	Th-227	48	QUANT	0.0840	1.8718e+001	D	1.0e-010	Y	Y
7	50.10	Fr-223	18	QUANT	0.3170	2.1800e+001	M	3.0e-007	Y	Y
8	53.20	U-234	0	QUANT	0.0012	2.4450e+005	Y	2.0e-011	Y	Y
9	59.00	Th-232	35	QUANT	0.0019	1.4050e+010	Y	5.0e-013	Y	Y
10	63.29	Th-234	27	QUANT	0.0381	2.4100e+001	D	6.0e-008	Y	Y
11	66.38	U-238	0	QUANT	0.0010	4.4680e+009	Y	2.0e-011	Y	Y
12	67.67	Th-230	0	QUANT	0.0037	7.7000e+004	Y	3.0e-012	Y	Y
13	74.82	Pb-212	17	QUANT	0.1069	1.0643e+001	H	1.0e-008	Y	Y
14	74.82	Pb-214	16	QUANT	0.0621	2.6800e+001	M	3.0e-007	Y	Y
15	74.97	Tl-208	56	QUANT	0.0343	3.0530e+000	M	0.0e+000	Y	Y
16	77.11	Pb-214	23	QUANT	0.1046	2.6800e+001	M	3.0e-007	Y	Y
17	77.11	Pb-212	22	QUANT	0.1800	1.0643e+001	H	1.0e-008	Y	Y
18	79.80	Fr-223	24	QUANT	0.0761	2.1800e+001	M	3.0e-007	Y	Y
19	83.78	Ra-223	31	QUANT	0.2470	1.1434e+001	D	3.0e-010	Y	Y
20	84.21	Th-231	0	QUANT	0.0644	2.5520e+001	H	3.0e-006	Y	Y
21	84.37	Th-228	46	QUANT	0.0121	1.9132e+000	Y	4.0e-012	Y	Y
22	87.30	Pb-212	49	QUANT	0.0804	1.0643e+001	H	1.0e-008	Y	Y
23	87.30	Pb-214	51	QUANT	0.0467	2.6800e+001	M	3.0e-007	Y	Y
24	88.47	Fr-223	47	QUANT	0.0242	2.1800e+001	M	3.0e-007	Y	Y
25	89.95	U-235	29	QUANT	0.0273	7.0380e+008	Y	2.0e-011	Y	Y
26	90.88	Pa-231	41	QUANT	0.0102	3.2760e+004	Y	6.0e-013	Y	Y
27	92.38	Th-234	28	QUANT	0.0272	2.4100e+001	D	6.0e-008	Y	Y
28	92.80	Th-234	10	QUANT	0.0269	2.4100e+001	D	6.0e-008	Y	Y
29	93.35	U-235	37	QUANT	0.0446	7.0380e+008	Y	2.0e-011	Y	Y
30	94.66	Pa-234	32	QUANT	0.1570	6.7000e+000	H	3.0e-006	Y	Y
31	94.90	Ra-223	38	QUANT	0.1120	1.1434e+001	D	3.0e-010	Y	Y
32	98.44	Pa-234	33	QUANT	0.2544	6.7000e+000	H	3.0e-006	Y	Y
33	111.00	Pa-234	36	QUANT	0.1185	6.7000e+000	H	3.0e-006	Y	Y
34	115.35	Ac-227	0	QUANT	0.0010	2.1773e+001	Y	2.0e-013	Y	Y
35	125.00	Th-232	9	QUANT	0.0004	1.4050e+010	Y	5.0e-013	Y	Y

APPENDIX D (continued)

36	131.20	Pa-234	55	QUANT	0.2040	6.7000e+000	H	3.0e-006	Y	Y
37	143.76	U-235	40	QUANT	0.1050	7.0380e+008	Y	2.0e-011	Y	Y
38	144.24	Ra-223	39	QUANT	0.0324	1.1434e+001	D	3.0e-010	Y	Y
39	154.21	Ra-223	52	QUANT	0.0558	1.1434e+001	D	3.0e-010	Y	Y
40	163.36	U-235	42	QUANT	0.0407	7.0380e+008	Y	2.0e-011	Y	Y
41	165.52	Pa-231	59	QUANT	0.0143	3.2760e+004	Y	6.0e-013	Y	Y
42	185.72	U-235	44	QUANT	0.5400	7.0380e+008	Y	2.0e-011	Y	Y
43	186.21	Ra-226	0	I.D.	0.0328	1.6000e+003	Y	3.0e-010	Y	Y
44	205.31	U-235	3	QUANT	0.0470	7.0380e+008	Y	2.0e-011	Y	Y
45	209.28	Ac-228	53	QUANT	0.0443	6.1300e+000	H	4.0e-009	Y	Y
46	215.98	Th-228	21	QUANT	0.0024	1.9132e+000	Y	4.0e-012	Y	Y
47	234.90	Fr-223	2	QUANT	0.0282	2.1800e+001	M	3.0e-007	Y	Y
48	236.00	Th-227	6	QUANT	0.1150	1.8718e+001	D	1.0e-010	Y	Y
49	238.63	Pb-212	60	QUANT	0.4465	1.0643e+001	H	1.0e-008	Y	Y
50	240.98	Ra-224	0	QUANT	0.0395	3.6200e+000	D	7.0e-010	Y	Y
51	241.98	Pb-214	57	QUANT	0.0749	2.6800e+001	M	3.0e-007	Y	Y
52	269.46	Ra-223	62	QUANT	0.1360	1.1434e+001	D	3.0e-010	Y	Y
53	270.23	Ac-228	63	QUANT	0.0360	6.1300e+000	H	4.0e-009	Y	Y
54	271.23	Rn-219	69	QUANT	0.0106	3.9600e+000	S	0.0e+000	Y	Y
55	272.10	Pa-234	65	QUANT	0.0102	6.7000e+000	H	3.0e-006	Y	Y
56	277.35	Tl-208	75	QUANT	0.0679	3.0530e+000	M	0.0e+000	Y	Y
57	295.21	Pb-214	68	QUANT	0.1925	2.6800e+001	M	3.0e-007	Y	Y
58	298.00	Tl-210	86	QUANT	0.7917	1.3000e+000	M	0.0e+000	Y	Y
59	300.08	Pa-231	61	QUANT	0.0230	3.2760e+004	Y	6.0e-013	Y	Y
60	300.09	Pb-212	13	QUANT	0.0341	1.0643e+001	H	1.0e-008	Y	Y
61	302.67	Pa-231	4	QUANT	0.0230	3.2760e+004	Y	6.0e-013	Y	Y
62	323.87	Ra-223	1	QUANT	0.0388	1.1434e+001	D	3.0e-010	Y	Y
63	327.64	Ac-228	66	QUANT	0.0321	6.1300e+000	H	4.0e-009	Y	Y
64	327.96	Bi-212	81	QUANT	0.0013	6.0550e+001	M	1.0e-007	Y	Y
65	328.00	Pa-234	76	QUANT	0.0031	6.7000e+000	H	3.0e-006	Y	Y
66	338.32	Ac-228	71	QUANT	0.1136	6.1300e+000	H	4.0e-009	Y	Y
67	351.07	Bi-211	0	QUANT	0.1294	2.1300e+000	M	0.0e+000	Y	Y
68	351.92	Pb-214	14	QUANT	0.3721	2.6800e+001	M	3.0e-007	Y	Y
69	401.81	Rn-219	54	QUANT	0.0650	3.9600e+000	S	0.0e+000	Y	Y
70	404.84	Pb-211	72	QUANT	0.0294	3.6100e+001	M	3.0e-007	Y	Y
71	409.51	Ac-228	74	QUANT	0.0213	6.1300e+000	H	4.0e-009	Y	Y
72	427.08	Pb-211	89	QUANT	0.0132	3.6100e+001	M	3.0e-007	Y	Y
73	438.70	Po-215	0	QUANT	0.0003	7.7800e-004	S	0.0e+000	Y	Y
74	463.00	Ac-228	84	QUANT	0.0443	6.1300e+000	H	4.0e-009	Y	Y
75	510.84	Tl-208	78	QUANT	0.2156	3.0530e+000	M	0.0e+000	Y	Y
76	569.50	Pa-234	80	QUANT	0.1091	6.7000e+000	H	3.0e-006	Y	Y
77	569.67	Po-211	93	QUANT	0.0054	5.1600e-001	S	0.0e+000	Y	Y
78	583.14	Tl-208	90	QUANT	0.8423	3.0530e+000	M	0.0e+000	Y	Y
79	609.31	Bi-214	82	QUANT	0.4628	1.9900e+001	M	3.0e-007	Y	Y
80	660.60	Pa-234	83	QUANT	0.0031	6.7000e+000	H	3.0e-006	Y	Y
81	727.17	Bi-212	64	QUANT	0.1183	6.0550e+001	M	1.0e-007	Y	Y
82	768.36	Bi-214	98	QUANT	0.0504	1.9900e+001	M	3.0e-007	Y	Y
83	768.70	Pa-234	91	QUANT	0.0057	6.7000e+000	H	3.0e-006	Y	Y
84	794.70	Ac-228	95	QUANT	0.0463	6.1300e+000	H	4.0e-009	Y	Y
85	797.30	Po-214	0	QUANT	0.0001	6.3700e-005	S	0.0e+000	Y	Y
86	799.70	Tl-210	106	QUANT	0.9896	1.3000e+000	M	0.0e+000	Y	Y
87	803.10	Po-210	0	QUANT	0.0000	1.3838e+002	D	3.0e-010	Y	Y
88	804.90	Po-216	0	QUANT	0.0000	1.4600e-001	S	0.0e+000	Y	Y
89	831.96	Pb-211	70	QUANT	0.0286	3.6100e+001	M	3.0e-007	Y	Y
90	860.37	Tl-208	15	QUANT	0.1245	3.0530e+000	M	0.0e+000	Y	Y
91	880.51	Pa-234	92	QUANT	0.1224	6.7000e+000	H	3.0e-006	Y	Y

APPENDIX D (continued)

92	883.24	Pa-234	96	QUANT	0.1224	6.7000e+000	H	3.0e-006	Y	Y
93	897.83	Po-211	77	QUANT	0.0052	5.1600e-001	S	0.0e+000	Y	Y
94	897.83	Tl-207	0	QUANT	0.0024	4.7700e+000	M	0.0e+000	Y	Y
95	911.07	Ac-228	100	QUANT	0.2770	6.1300e+000	H	4.0e-009	Y	Y
96	926.00	Pa-234	99	QUANT	0.1122	6.7000e+000	H	3.0e-006	Y	Y
97	926.18	Pa-234m	102	QUANT	0.0037	1.1700e+000	M	0.0e+000	Y	Y
98	934.06	Bi-214	103	QUANT	0.0321	1.9900e+001	M	3.0e-007	Y	Y
99	946.00	Pa-234	105	QUANT	0.1224	6.7000e+000	H	3.0e-006	Y	Y
100	964.60	Ac-228	101	QUANT	0.0521	6.1300e+000	H	4.0e-009	Y	Y
101	969.11	Ac-228	45	QUANT	0.1662	6.1300e+000	H	4.0e-009	Y	Y
102	1001.00	Pa-234m	97	QUANT	0.0059	1.1700e+000	M	0.0e+000	Y	Y
103	1120.30	Bi-214	104	QUANT	0.1515	1.9900e+001	M	3.0e-007	Y	Y
104	1238.10	Bi-214	107	QUANT	0.0594	1.9900e+001	M	3.0e-007	Y	Y
105	1240.50	Pa-234	30	QUANT	0.0051	6.7000e+000	H	3.0e-006	Y	Y
106	1310.00	Tl-210	58	QUANT	0.2078	1.3000e+000	M	0.0e+000	Y	Y
107	1377.70	Bi-214	109	QUANT	0.0411	1.9900e+001	M	3.0e-007	Y	Y
108	1460.80	K-40	0	QUANT	0.1067	1.2770e+009	Y	2.0e-007	Y	Y
109	1764.50	Bi-214	79	QUANT	0.1584	1.9900e+001	M	3.0e-007	Y	Y

APPENDIX D

CONSTRUCTION QUALITY ASSURANCE PLAN

TABLE OF CONTENTS

LIST OF FIGURES
(Following Report)

LIST OF TABLES

LIST OF ATTACHMENTS

GLOSSARY

CQA	Construction Quality Assurance
CQAP	Construction Quality Assurance Project Plan
HS	Health and Safety
HASP	Health and Safety Plan
IEMA	Illinois Emergency Management Agency
OSHA	Occupational Safety and Health Administration
QA	Quality Assurance
QC	Quality Control
RA	Removal Action
U.S.EPA	United States Environmental Protection Agency

1.0 INTRODUCTION

Conestoga-Rovers & Associates (CRA) has prepared this Construction Quality Assurance Plan (CQAP) for the property referred to as the Fairbanks and Ohio Autopark, Chicago, Illinois (Site). The Site is currently occupied by an active pay parking lot, a fast food restaurant and a vacant metal building.

The activities outlined in the Removal Action Work Plan (RAWP) involve excavation and off-site disposal of radiological-impacted soil/fill material from beneath the Site. The excavated area will be backfilled as required to facilitate future use of the Site. Remediation of the Site is being undertaken in support of planned redevelopment including construction of a high-rise, multi-use building. The remediation program is being undertaken on a voluntary basis under agreement with the United States Environmental Protection Agency (U.S.EPA).

1.1 PURPOSE AND ORGANIZATION OF REPORT

This CQAP presents the quality assurance program to be used during implementation of the Removal Action (RA) at the Site. The purpose of the CQAP is to ensure that the RA activities meet or exceed all design criteria and requirements.

This CQAP is organized as follows:

i) Section 1.0 presents the background information, purpose and organization of the report;

ii) Section 2.0 provides a description of the project;

iii) Section 3.0 outlines the project organization and responsibilities;

iv) Section 4.0 presents the personnel qualification requirements;

v) Section 5.0 presents the project meeting requirements;

vi) Section 6.0 describes the inspection and testing activities required to ensure that construction and materials comply with all design specifications and plans; and

vii) Section 7.0 describes the documentation requirements of the Construction Quality Assurance (CQA) activities.

2.0 PROJECT DESCRIPTION

The remediation activities will be focused on the removal of radiological-impacted soil/fill material. It is expected that the excavation will extend through the complete thickness of the fill material over the entire Site area. The excavation may also extend into the underlying native material depending on the results of verification testing to be performed.

The general sequence of activities, will be as follows:

- preparatory work, including obtaining required permits and approvals, and utility clearances;
- mobilization of materials, equipment and temporary support facilities;
- site surveying, clearing existing structures and fence removal;
- removal of asphalt, and walkover survey for presence of impacted soil / fill;
- sheeting / shoring and excavation, staging and removal of impacted soil / fill to required depth;
- confirmatory soil sampling and analysis;
- backfilling and Site restoration; and
- project closeout.

This CQAP applies to the activities associated with soil excavation and associated testing.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Figure D.3.1 shows the Project Organizational Chart including Quality Assurance (QA) and Quality Control (QC). Duties and responsibilities including QA and QC are listed below.

3.1 PROJECT MANAGER

- Serves as the Owner's Representative.
- Acts as primary contact with agency personnel.

3.2 PROJECT COORDINATOR

- Provides assistance to Project Manager.
- Provides overall project coordination function.
- Assures adherence to work plan requirements.
- Acts as primary contact with project personnel and RA Contractor.

3.3 PROJECT ENGINEER

- Provides day-to-day construction management/liaison with RA Contractor.
- Provides engineering and other technical support during construction.
- Assures adherence to contracts and schedules.
- Coordinates QA and construction work.
- Maintains job record and reviews submittal and schedules.
- Reviews work performed and disapproves defective work.
- Conducts pre-final and final inspections of completed work.
- Prepares as-built drawings.
- Conducts meetings as required.
- Verifies quantities of materials used.

3.4 SITE ENGINEER / CQA OFFICER

- Reports to the Project Engineer.
- Executes the approved CQAP.
- Provides field management of CQA activities.
- Provides day-to-day liaison with radiological laboratory and Health Physics Contractor.
- Performs independent on-Site inspections of the work to assess compliance with project standards.
- Conduct CQA tests and inspections as indicated in the CQAP.
- Record test results and inspections daily.
- Reviews, records, and maintains all test data.
- Reports the results of all inspections to the Project Engineer.
- Identifies work that should be accepted, rejected, or uncovered for observation or that may require special testing, inspection, or approval.
- Verifies that corrective measures are implemented.
- Prepares final documents and certifications at the request of the Project Engineer for addition to the Project Closeout Report.

3.5 RA CONTRACTOR

- Provides required plans, e.g., health and safety, construction work plans.
- Constructs the project according to the project requirements.
- Obtains all necessary construction permits and approvals.
- Provides project schedules and other required submittals.
- Maintains "record drawings" at the Site properly noting all changes made during construction.
- Is responsible for health and safety of Site personnel, including health and safety orientation and training.
- Cooperates with inspection authorities.
- Manages own subcontractors.
- Retains qualified testing firms (e.g., laboratory, geotechnical) for testing of materials and workmanship to ensure that materials meet specified requirements.

- Submits samples and/or materials for testing to determine if samples and/or materials meet specified requirements, and submits results directly to the CQA Officer.
- Provides Site security.

3.6 HEALTH PHYSICS CONTRACTOR

- Undertakes radiological walkover surveys within excavation areas.
- Provides Health Physics support.
- Undertakes surveys of equipment that has been in contact with contaminated soils.
- Undertakes daily walkover surveys.
- Responsible for personnel dosimetry.
- Responsible for on-Site pre-verification sample analysis.

4.0 PERSONNEL QUALIFICATIONS

4.1 PROJECT MANAGER

- Consulting firm experienced in site investigation, assessment and design and construction of contaminated site remedies.

4.2 PROJECT COORDINATOR

- Consulting firm experienced in site investigation, assessment and design and construction of contaminated site remedies.

4.3 PROJECT ENGINEER

- Consulting firm experienced in design and construction of contaminated site remedies.

4.4 SITE ENGINEER / CQA OFFICER

- Graduate of a recognized college in a technically related field.
- Minimum of 3 years experience in the oversight and implementation of contaminated site remediation and construction QA activities.
- Working knowledge of relevant codes and regulations concerning material and equipment installation, observation and testing procedures, equipment, documentation procedures, and site safety.

4.5 RA CONTRACTOR

- Experience in contaminated site remediation (minimum 5 years of corporate experience).
- Thorough knowledge of testing procedures, equipment, and documentation procedures required for implementation of the remedial activities.
- Senior level point of contact (minimum 10 years experience in contaminated site remediation or equivalent).

- An on-Site Construction Superintendent (minimum 8 years experience in contaminated site remediation or equivalent) empowered to act on behalf of the Contractor in all field related matters pertaining to the remedial activities.

4.6 HEALTH PHYSICS CONTRACTOR

- Experience in radiological survey techniques (minimum 5 years of corporate experience).
- Experience in high-resolution gamma spectroscopic analysis.
- Thorough knowledge of survey meters and related detectors.
- Experience in personnel dosimetry techniques and requisite documentation and reporting requirements.
- Senior level point-of-contact (minimum 10 years of experience in the Health Physics arena).

5.0 PROJECT MEETINGS

Project meetings will be held during the performance of the RA to ensure that all tasks are accomplished according to schedule and that they are completed in accordance with the project requirements. It is anticipated that these progress meetings will be attended by the Project Coordinator, Project Engineer, Site Engineer/CQA Officer, Health Physics Contractor, and RA Contractor Representative(s).

5.1 PRECONSTRUCTION MEETING

Purpose: To resolve any uncertainties in the project requirements, and to review levels of responsibility, reporting requirements, and health and safety requirements.

Participants: Project Coordinator, Project Engineer, Site Engineer/CQA Officer, Contractor Superintendent, HS Officer, Health Physicist.

Topics:

- Discuss RA Work Plan, CQAP, Site-specific Health and Safety Plan (HASP), project schedule, and other relevant documents.
- Review the activities to be conducted during the RA.
- Review roles of each organization relative to the overall project requirements and the CQAP.
- Review lines of authority and communication.
- Discuss the established procedures or protocol for observations and tests including sampling strategies.
- Discuss methods to be used for undertaking and reporting verification and pre-verification sampling and analysis.
- Discuss the established procedures or protocols for handling construction deficiencies, repairs, and retesting.
- Review methods for documenting and reporting inspection data.
- Review methods for distributing and storing documents and reports.
- Review work area delineation, security, and safety protocols.
- Discuss the location for storing equipment and materials, and the protection of these items during inclement weather.

- Discuss the protection of uncompleted remedial work during off hours and during inclement weather.
- Conduct a Site tour to review remediation areas, safety areas, and equipment and stockpile storage locations.
- Confirm that each party understands and accepts its responsibility to ensure that the RA is performed to meet or exceed the specified design criteria.

5.2 DAILY PROGRESS MEETING

Purpose: To review daily work schedule progress and health and safety issues. This meeting is intended to be an informal meeting held at the start or end of each work day.

Participants: Site Engineer/CQA Officer, Contractor Superintendent, HS Officer.

Topics:
- Review previous day's activities and progress.
- Review work location and activities for the next day.
- Review health and safety deficiencies from the previous work day and review health and safety requirements and potential problems for the next day's activities.
- Review RA Contractor's personnel, subcontractor personnel, and equipment assignments for the next day.
- Discuss any potential construction problems.

5.3 WEEKLY PROGRESS MEETINGS

Purpose: To review update of work schedule progress and plans on a weekly basis, and identify schedule slippage and corrective efforts, if required.

Participants: Project Engineer, Site Engineer/CQA Officer, Contractor Superintendent, HS Officer, Health Physicist.

Topics:
- Health and Safety report for previous week's activities and progress for the coming week's activities.
- Review work activities from the previous week.

- Comparison of actual progress to scheduled work activities, noting schedule slippage and actions to be implemented to rectify schedule slippage.
- Review work activities for the next week.
- Review potential remedial problems and proposed solutions.

6.0 QA INSPECTION AND TESTING ACTIVITIES

6.1 SCOPE

Throughout the implementation of the RA, there will be continuous field inspections and testing requirements for specific work tasks. The field inspection and testing activities will ensure completion of the work according to the designated QA/QC requirements.

Field inspections and testing will provide a qualitative and quantitative means of monitoring the quality and progress of work performed.

The components that will require field inspection or testing are as follows:

- Soil/fill excavation and handling; and
- Backfilling and compaction.

Sampling and analysis of excavated material and post-excavation material for radiological parameters will be conducted as described in the RA Work Plan Appendix E – Sampling and Analysis Plan. The RA Contractor will provide assistance to the Site Engineer to facilitate sample collection. Sample analyses will be performed by an independent subcontract laboratory. The Project Engineer and the Site Engineer/CQA Officer will ensure day-to-day coordination of the RA Contractors activities relative to the radiological testing results.

6.2 FIELD INSPECTIONS

Field inspections will be completed throughout the construction by the Site Engineer/CQA Officer, who will have the primary responsibility for conducting and documenting all QA inspection activities.

The inspections will examine the following, as applicable:

- Quality of workmanship;
- Conformance with specified lines, grades, and elevations;
- Conformance with relevant permit requirements; and
- Conformance with required handling procedures.

Documentation of all QA inspection activities will be included in the Site Engineer/CQA Officer's log book. Specific observations and results will be documented and attached to the Construction QA Reports.

Any inspection failures, conformance problems, or other concerns will be reported immediately to the Project Engineer.

The specific inspection activities, frequencies, and documentation requirements are summarized in Table D.6.1.

7.0 CQA DOCUMENTATION

7.1 GENERAL

This section describes the documentation requirements for the CQA activities. The proper, thorough, and accurate documentation of all CQA activities is necessary to verify that the RA was completed according to the specified requirements.

CQA documentation shall consist of daily records, photographic records, weekly progress reports, and a final report. All records will be maintained at the Site by the Site Engineer/CQA Officer, and copies submitted to the Project Engineer.

7.2 DAILY RECORDS

At a minimum, daily records shall consist of field notes, summaries of daily meeting with the RA Contractor, observation and data sheets, and documentation of any construction problems and associated resolution.

The Site Engineer/CQA Officer will record daily QA activities on observation and data sheets. The observation and data sheets shall include the following information, as applicable:

- Date, time, and weather conditions.
- Description of ongoing construction and inspection activities.
- A reduced scale Site plan showing work area, including test locations for each work day.
- A summary of test results identified as passing or failing; or in the event of a failed test, retest results.
- Test equipment calibrations, if applicable.
- Off-Site materials received and approvals given.
- A summary of decisions regarding acceptance of the work and/or corrective actions taken.
- Submittals made by suppliers verifying material quality.
- Quality control test and inspection results.
- Construction delays/causes and areas affected.
- QA personnel on Site.

- QA equipment on Site.
- Record of instructions given by the Project Engineer.
- Record of changed conditions/conflicts encountered.
- Contractor's crew size, equipment, and hours worked.
- Signature of Site Engineer/CQA Officer.

7.3 PHOTOGRAPHS

A photographic record of construction activities will be maintained by the Site Engineer/CQA Officer. Photographs will be identified by location, time, date, and individual photographer.

7.4 WEEKLY PROGRESS REPORTS

The Site Engineer/CQA Officer will prepare weekly progress reports summarizing construction and QA/QC activities. At a minimum, weekly progress reports shall include the following information:

- Date, project name, and location.
- Summary of work activities for the week.
- Summary of deficiencies and/or defects and corrective actions.
- Signature of Site Engineer/CQA Officer.

7.5 FINAL REPORT

Upon completion of the RA construction, the Site Engineer/CQA Officer will submit a report to the Project Engineer that summarizes the CQA activities performed during the construction. The report shall contain, at a minimum, the following information:

- Summary of all quality assurance activities.
- Complete set of observation and data sheets and field notes.
- Complete set of construction photographs.
- Sampling, inspection, and testing location plans and results.

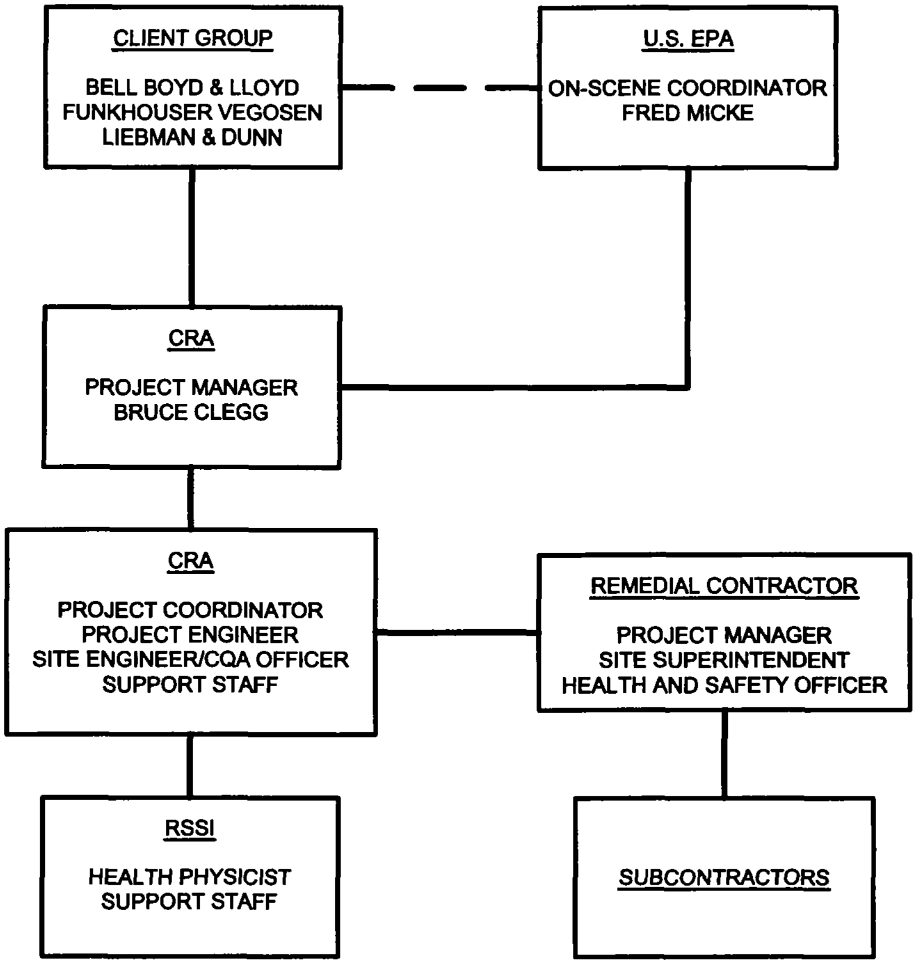


figure D.3.1

PROJECT ORGANIZATION
FAIRBANKS AND OHIO
Chicago, Illinois

TABLE D.6.1

SUMMARY OF CONSTRUCTION QUALITY ASSURANCE INSPECTIONS AND TESTING

Work Component to be Inspected	Items to be checked during Inspection	Type of Inspection	Frequency of Inspection	Submittals to Site Engineer	Testing Information
Soil excavation/handling	• excavation limits • stockpiled soil properly stored and marked	• field survey • visual	• daily as required • daily as required		See note 1
Backfilling (using excavated material)	• type of backfill • placement and compaction methods • compaction levels	• visual and Survey meter • visual • compaction tests	• daily as required • daily as required • once per lift	• test results	See notes 2 and 4
Backfilling (using imported material)	• source of backfill • type of backfill • placement and compaction methods • compaction levels	• none • visual • visual • compaction tests	• none • daily as required • daily as required • once per lift	• certification of each source • test results	See notes 3 and 4

1) Radiological testing will be performed to determine requirements for material handling, backfilling and disposal in accordance with Appendix E - Sampling and Analysis Plan.
2) The excavation(s) will be backfilled with excavated soil/fill material that has been determined to be suitable on the basis of confirmatory testing results and assessment of engineering properties.
3) If required, clean imported fill material comprising free-draining granular sand or sand and gravel will be used. Documentation of the source of backfill material will be required.
4) Backfilling operations will be carried out such that adequate heavy vibration equipment is used to compact the material. The backfill will be placed in loose lifts not exceeding 1 foot in thickness, and will be compacted to a minimum of 95 percent standard Proctor maximum dry density (SPMDD). Representative samples of each source/type of backfill material will be collected and submitted to a geotechnical laboratory for determination of standard Proctor density in accordance with ASTM D698. A geotechnical engineer or technician will witness backfilling operations, and compaction testing will be performed at a sufficient frequency to document the placement and compaction results. Compaction testing will be performed using a nuclear densiometer in accordance with ASTM D2922, or other equivalent method.

ATTACHMENT D.A

TYPICAL CONTRACTOR'S DAILY CONSTRUCTION REPORT

DAILY CONSTRUCTION REPORT

Doc. No.: A-______

Site Name: ______________________________

Date: ____________

Time: ____________

Weather Conditions: ______________________________

Site Personnel/Visitors:

Project Coordinator ______________________________

CQA Inspector ______________________________

Agency ______________________________

Contractor ______________________________

____

Equipment: ______________________________

Construction Activities Performed:

____

Summary of Work Items Completed:

Item	*Description*	*Quantity*	*Unit*

DAILY CONSTRUCTION REPORT

Doc. No.: A-______

Site Name: ______________________ Date: ____________

Materials Imported:	Submittal	Comments	Approval
1.______	Yes/No	______	Yes/No
2.______	Yes/No	______	Yes/No
3.______	Yes/No	______	Yes/No
4.______	Yes/No	______	Yes/No
5.______	Yes/No	______	Yes/No
6.______	Yes/No	______	Yes/No
7.______	Yes/No	______	Yes/No
8.______	Yes/No	______	Yes/No

Testing Activities Performed/Location		Comments	Acceptance
1.______	Yes/No	______	Yes/No
2.______	Yes/No	______	Yes/No
3.______	Yes/No	______	Yes/No
4.______	Yes/No	______	Yes/No
5.______	Yes/No	______	Yes/No
6.______	Yes/No	______	Yes/No
7.______	Yes/No	______	Yes/No
8.______	Yes/No	______	Yes/No

Sampling and Analysis Activities Performed/Location		Comments	Acceptance
1.______	Yes/No	______	Yes/No
2.______	Yes/No	______	Yes/No
3.______	Yes/No	______	Yes/No
4.______	Yes/No	______	Yes/No
5.______	Yes/No	______	Yes/No
6.______	Yes/No	______	Yes/No
7.______	Yes/No	______	Yes/No
8.______	Yes/No	______	Yes/No

Testing Equipment Calibration

____

____

Notes

____

____

____

____

PROJECT COORDINATOR: ______________________

CQA INSPECTOR: ______________________

CONTRACTOR SUPERINTENDANT: ______________________

APPENDIX E

FIELD SAMPLING PLAN

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

This Field Sampling Plan (FSP) has been prepared by Conestoga-Rovers & Associates (CRA) on behalf of Bell Boyd & Lloyd and Funkhouser Vegosen Liebman & Dunn Ltd. for the Fairbanks and Ohio Autopark Site, Chicago, Illinois (Site). CRA has been retained to oversee the implementation of the scope of work outlined in the Work Plan.

In addition to the Work Plan and FSP, several other documents have been prepared to assist in the overall goal of successfully completing the Removal Action Work Plan, including:

- Quality Assurance Project Plan; and
- Health and Safety Plan.

The purpose of this FSP is to outline the protocols that will be implemented to perform field activities associated with the Site Removal Action. The FSP supplements the Quality Assurance Project Plan (QAPP) and addresses all sample and field data collection activities. The FSP specifies the sample collection schedules, equipment, and personnel, and includes a Site Plan. The FSP includes a description of monitoring equipment, sampling, and laboratory testing, including:

- description of sampling tasks;
- description of required data collection and laboratory tests;
- required quality assurance and quality control;
- schedule of monitoring frequency;
- identification of monitoring equipment;
- installation of monitoring components; and
- maintenance of site equipment.

The FSP also includes recording and reporting mechanism requirements, including:

- daily operating logs, including the field log book;
- laboratory records;
- mechanisms for reporting emergencies or operational difficulties; and
- personnel and maintenance records.

2.0 GENERAL FIELD PROTOCOLS

2.1 OVERVIEW

General protocols applicable to field activities to be completed under this Removal Action are summarized herein.

2.2 DECONTAMINATION PROCEDURES

2.2.1 SAMPLING EQUIPMENT

Excavation equipment will be used, where appropriate (e.g., stockpile sampling) to facilitate sample collection. Prior to use, the bucket of the excavator will be thoroughly decontaminated with a high-pressure, hot water wash to remove oil, grease, mud, and other foreign matter.

Equipment decontamination will be performed on the designated decontamination pad. The decontamination pad will facilitate capture of cleaning fluids for proper management. Collected decontamination fluids will be managed as described in Section 2.4.

2.2.2 SAMPLING TOOLS

Sampling tools, such as trowels used for soil sample collection, will be decontaminated prior to field use and after each sample is collected to prevent cross-contamination between samples. Whenever practicable, dedicated sampling tools will be used to minimize the potential for sample cross contamination.

Decontamination of tools used for collection of samples for laboratory analyses will be performed as follows:

i) wash with potable water and a low-phosphate detergent (Alconox™, Liquinox™ or similar) using a brush, if necessary, to remove all visible foreign matter;
ii) rinse thoroughly with potable water;
iii) rinse thoroughly with distilled water; and
iv) allow the equipment to air dry on a clean plastic sheet as long as possible.

Following the final rinse, each sampling tool will be visually inspected to verify that it is free of soil particulates and other solid material that could contribute to possible sample cross contamination.

Fluids used for cleaning will not be recycled. Decontamination fluids will be managed as described in Section 2.4.

2.3 FIELD LOG DOCUMENTATION

The field logbook will be a bound document with consecutively numbered pages. The entries for each day will commence on a new page, which will be dated. All entries will be made only in indelible ink. Corrections will be made by marking through the error with a single line, to remain legible, and initialing this action followed by writing the correction. The person making the entries in the logbook will sign or initial each page of entries as they are completed.

The field logbooks generated will be numbered consecutively and maintained by one of CRA's Site representatives. Upon completion of the fieldwork or during periods when fieldwork is not scheduled, the field logbooks will be maintained in CRA's Chicago office. Ultimately, after completion of all stages of fieldwork, the logbooks will be maintained in the document file in CRA's Chicago, Illinois office.

The following information will be recorded in the field logbook for each sample collected:

i) Site location identification;

ii) unique sample identification number;

iii) date and time (in 2400-hour time format) of sample collection;

iv) weather conditions;

v) designation as to the type of sample (stockpile, verification, etc.);

vi) designation as to the means of collection (composite, grab, etc.);

vii) name of sampler;

viii) analyses to be performed on sample;

ix) any other relevant comments such as odor, color, texture, etc.; and

x) sample location.

2.4 WASTE HANDLING PROTOCOLS

Wastes generated during the investigation may include general refuse and decontamination fluids. General refuse, including plastic sheeting, buckets, paper bags, etc. will be disposed of in waste receptacles. Daily refuse and personal protective equipment (PPE) will be collected in plastic bags and disposed of as necessary to keep the Site area neat. Bulk decontamination fluids will be utilized for dust suppression on the soil stockpile designated for off-Site disposal.

3.0 INVESTIGATIVE PROTOCOLS

3.1 OVERVIEW

In order to support soil removal activities, various forms of monitoring for radiological characteristics may occur. The following discussion details each form of soil monitoring proposed to support this Removal Action.

3.2 GAMMA RADIATION SURVEYS

3.2.1 SURFACE SURVEYS

A surface survey will be conducted to evaluate gamma emitters present at ground surface. Once soil top cover (i.e., asphalt or concrete) is removed and following excavation of soil to designated design elevations, the exposed soil surface will be surveyed in accordance with the gamma radiation level survey procedures set out by Appendix E.A. However, prior to surveying, perpendicular grid lines will be established at 5 meter intervals. The locations will be established with ground layout survey techniques and marked with stakes/flagging and paint. Gamma count values will be recorded at each node (i.e., at 5 meter intervals) and within each grid. In order to conduct the survey, the sodium iodide (NaI) survey probe will be positioned normal to ground surface at an average elevation of 2 to 6-inches above ground surface. Grid lines will be traversed at a maximum speed of approximately 0.5 meters per second. Gamma readings will be evaluated in additional areas to grid nodes where individual anomalies are observed.

3.2.2 RADIOLOGICAL SURVEY OF ON-SITE EQUIPMENT

Equipment operating in active work zones where the potential for contact with contaminated soils is possible will be surveyed prior to movement to a contaminant reduction zone or demobilization from the Site. Equipment surveys will be conducted by moving the NaI probes over the exposed surfaces of each item of equipment being monitored. The survey meter will be operated in accordance with the procedures set out by Appendix E.A.

3.2.3 DAILY SURVEYS

Routine daily surveys will be performed for each day of Site operations. Routine surveys will monitor areas in the immediate vicinity of excavations and along movement paths to ensure that radiation levels are not affected by ongoing Site operations.

3.3 VERIFICATION SAMPLING

Once gamma surveying indicates that the base of excavations are likely less than 7.1 pCi/gm, a verification sample will be collected. The verification sample will be comprised of a 5-point composite sample with individual sample aliquots collected from the diagonals and center point of a 10 meter x 10 meter sampling grid. Specifically, each area at the base of an excavation believed to be "clean" based on a surface survey will be delineated in 10 meter by 10 meter squares. Diagonals will be established through each corner and intersecting at the center. Four sample aliquots of approximately one gallon each will be collected from the midpoint of each diagonal between a corner and the center. In addition, a one gallon sample aliquot will be collected from the center of each grid. The sample aliquots will be combined and homogenized in a five gallon metal pail following removal of rocks, sticks, and foreign objects greater than approximately 1 inch in diameter. Following homogenization, the sample will be analyzed via the "bucket method" (see Appendix E.A). Finally, a 500-mL aliquot of the homogenized material will be placed in an appropriate sample container, i.e., marinelli beaker, for off-Site high resolution gamma spectroscopy analysis (see QAPP). Split samples of the homogenized materials will be available for U.S. EPA or its designated representatives' use if requested.

3.4 SOIL STOCKPILE SAMPLING

3.4.1 OVERVIEW

The objective of sampling the on-Site soil stockpile is to confirm that materials designated for off-Site disposal at Envirocare's Facility exceed U.S. EPA's 7.1 pCi/gm cleanup standards and that "clean" soils to be used as backfill are less than 7.1 pCi/gm. Further details soil on stockpile sampling are provided by the following.

3.4.2 DESIGNATED SOIL STOCKPILE

The stockpile will be divided into sections comprised of approximately 100 cubic yards per section. One composite soil sample will be collected from each of the sections for high resolution gamma spectroscopy analysis. An excavator will be used to remove soil from within the stockpile. Commencing from the top of the stockpile, successive buckets of material will be removed. A soil sub-sample will be collected from the middle of each bucket. Soil sampling will terminate at an elevation of approximately one foot above surrounding grade to prevent accidental penetration of the stockpile underliner during soil sampling activities.

Soil sample collection protocols for the stockpile are summarized below.

i) The stockpile will be divided into sections consisting of approximately 100 cubic yards per section and one sample excavation location will be selected in the center of each section.

ii) The sample excavation will extend downward to approximately 1-foot above the base of the stockpile. One soil sub-sample will be collected from each bucket of excavated material.

iii) The soil sub-sample will be collected from within the middle of the bucket, and the remaining material will be cast onto the stockpile, away from the sample location. At completion of the sample location, the excavated material will be replaced into the same area from which it was removed.

iv) The soil will be placed into a clean stainless-steel mixing bowl. The soils within the stainless-steel bowl will be homogenized by mixing the soils with a pre-cleaned stainless-steel spoon or trowel. The composite soil sample will then be placed in laboratory-supplied 500-mL sample containers (marinelli beakers) and sent to the laboratory for analysis.

4.0 ANALYTICAL PLAN

4.1 OVERVIEW

Soil samples collected during the Removal Action will be analyzed by high resolution gamma spectroscopy. RSSI of Morton Grove, Illinois will perform the analyses. The Removal Action analytical program is summarized in the QAPP.

4.2 SAMPLE HANDLING AND DOCUMENTATION PROTOCOLS

4.2.1 SAMPLE LABELING

Each sample will be labeled with a unique sample number that will facilitate tracking and cross-referencing of sample information. The sample numbering system to be used is described as follows:

Example: SS-MMDDYY-XX-001

where:

SS	-	designates types of sample (SS-stockpile, V-verification)
MMDDYY	-	designates date of collection presented as month/day/year
XX	-	designates sampler's initials
001	-	designates sequential number starting with 001 at the start of the project

Field duplicate samples also will be numbered with a unique sample number, consistent with the numbering system described above, to prevent laboratory bias of field QC samples.

4.2.2 SAMPLE CONTAINERS AND HANDLING

Required sample containers are identified in Section 3.4.2. Samples will be placed in appropriate sample containers, labeled, and properly sealed. Sample labels will include sample number, date and time of collection, and analyses to be performed. Samples will be cushioned within the shipping containers by the use of bubble pack. Samples will be shipped by commercial courier or hand delivered on a regular basis to the project laboratory.

Two seals comprised of the engineer's chain-of-custody tape will be placed over the lid on the front and back of each shipping container prior to shipment to secure the lid and provide evidence that the samples have not been tampered with en route to the laboratory. The on-Site CRA representative conducting the sampling will be responsible for packaging the samples and sealing and delivering the shipping container to a courier or directly to the laboratory.

Upon receipt of the shipping container at the laboratory, the shipping container will be inspected by the designated sample custodian. The sample custodian will note the condition of the shipping container and seal on the chain-of-custody form. The sample custodian will document the date and time of receipt of the shipping container and sign the chain-of-custody forms.

The sample custodian then will check the contents of the shipping container with those samples listed on the chain-of-custody form. If damage or discrepancies are noticed, the sample custodian will contact CRA for resolution.

4.2.3 CHAIN-OF-CUSTODY FORMS

Chain-of-custody records will be used to track all samples from time of sampling to the arrival of samples at the laboratory. Each shipping container being sent to the laboratory will contain a chain-of-custody form. The chain-of-custody form consists of four copies, which are distributed to the sampler, to the shipper, to the contract laboratory, and to the office file of the engineer. The sampler and shipper will maintain their copies while the other two copies are enclosed in a waterproof enclosure within the shipping container. The laboratory, upon receiving the samples, will complete the remaining copies. The laboratory will maintain one copy for its records. The executed original will be returned to the engineer with the data deliverables package.

A typical chain-of-custody form is presented on Figure E.4.1.

4.3 QUALITY CONTROL

Field duplicates will be collected and analyzed to assess the quality of the data resulting from the field sampling program. Field duplicates are obtained to assess the reproducibility of the analytical data. The investigative and duplicate samples will be obtained from the homogenized aliquot of soil. Each sample will be assigned a unique sample identification number. Field duplicates will be obtained at a rate of one per 20 investigative samples and analyzed by high resolution gamma spectroscopy.

The Quality Assurance Project Plan (QAPP) prepared for this project provides specific details regarding protocols and checks associated with laboratory analyses and sampling procedures.

4.4 RADIOLOGICAL LABORATORY

Samples for high resolution gamma spectroscopy analysis will be delivered to the following laboratory:

RSSI
6312 W. Oakton Street
Morton Grove, Illinois 60053-2723
Telephone: (847) 965-1999
Telefax: (847) 965-1991

5.0 PROJECT ORGANIZATION AND RESPONSIBILITY

CRA, consultant to Bell Boyd & Lloyd and Funkhouser Vegosen Liebman & Dunn Ltd., has overall responsibility for all stages of the Removal Action. CRA will perform the sampling activities. All samples will be analyzed by RSSI of Morton Grove, Illinois.

All subcontracted firms will provide project management as appropriate to their responsibilities. CRA will maintain a file copy of all laboratory deliverables. All final project deliverables will be issued by CRA at the explicit direction of the client Group. A summary of each of the key person's responsibilities is presented in the QAPP.

Primary responsibility for project quality rests with CRA's Project Manager. Independent quality assurance will be provided by the laboratory's Project Manager.

During the sampling stage of the project, daily contact between CRA and the laboratory subcontractor will occur. The laboratory will provide status updates by means of preliminary data emails or telefacsimiles. Should unexpected delays or other problems with the laboratory analyses occur, these would be communicated directly to CRA for resolution. Daily meetings with subcontractors will be held to update the progress of the project activities.

Key CRA contacts during the Removal Action activities are:

Bruce Clegg - Project Manager
Julian Hayward - Project Coordinator
Steve Day - Quality Assurance Officer
To Be Determined – Field Coordinator
 and Field Quality Assurance Officer
Bryan Hickman – Health and Safety Officer
 (also referred to as Site Health and Safety Coordinator)

6.0 HEALTH AND SAFETY PLAN

A Site-specific Health and Safety Plan (HASP) has been developed to address activities to be performed at the Site. All field activities will be conducted in accordance with the health and safety protocols outlined in the HASP. The HASP is provided in Appendix G and may be modified in the future to incorporate additional activities proposed during supplemental activities.

7.0 PROJECT DATA MANAGEMENT

7.1 FIELD ACTIVITIES

Information collected during field activities includes, but is not limited to, the following:

- Site layout and survey data;
- Daily records of work conducted;
- Walkover survey results;
- Inventory of materials quantities;
- Screening testing results;
- Sample location surveys;
- Shipping/disposal records;
- Backfill/compaction details and test results; and
- Air monitoring data.

A record of information from the field activities will be maintained by the Site Engineer/Construction Quality Assurance (CQA) Officer. The information will be retained on-Site in hard copy and/or electronic data format. The completed information will be transferred to CRA's permanent office at completion or at intervals as appropriate to the specific type of information and the stage of the work at the Site.

7.2 SAMPLE MANAGEMENT AND TRACKING

All field samples will be collected and maintained under the supervision of the Site Engineer/CQA Officer, and in accordance with the requirements of the FSP and QAPP. Chain-of-custody procedures will be utilized for all samples collected for radiological analysis.

Analytical reports will be provided by the laboratory directly to the Quality Assurance Officer (QAO) and the Site Engineer/CQA Officer. The data will be treated as preliminary and not released for use until the Quality Assurance/Quality Control (QA/QC) review has been performed by the QAO. Final laboratory reports and QA/QC reports will be maintained by the QAO. The final results and associated QA/QC qualifiers will be maintained in electronic database format and tabulated for use and presentation.

7.3 DOCUMENT CONTROL AND INVENTORY

Sample results will be managed in a standardized electronic database format. The database will include the following data fields, at minimum:

- Unique sample identification
- Sample type
- Analytical result
- Detection limit
- Data qualifier

All field activities will be recorded daily in the field logbooks. Upon completion of the fieldwork or during periods when fieldwork is not scheduled, the field logbooks will be maintained in CRA's Chicago office. All data originals, including field forms, chain-of-custody forms, and laboratory data deliverables will be maintained in CRA's Chicago office.

Computer-generated data tables will be verified with original laboratory certificates of analysis and with the original field logbook or field-generated forms. Both hard paper copies and computer-based versions of summary tables will be saved in the files. Land survey data will be maintained in the project file as hard copy, and the electronic survey data will be stored with the project's AUTOCAD files.

CRA
CONESTOGA–ROVERS & ASSOCIATES
8615 West Bryn Mawr Avenue
Chicago, IL 60631 (773)380-9933

CHAIN OF CUSTODY RECORD

SHIPPED TO (Laboratory Name):

REFERENCE NUMBER:

PROJECT NAME:

SAMPLER'S SIGNATURE: ______________ PRINTED NAME: ______________

SEQ. No.	DATE	TIME	SAMPLE No.	SAMPLE MATRIX	No. OF CONTAINERS	PARAMETERS										REMARKS
			SAMPLE													
			TOTAL NUMBER OF CONTAINERS													

RELINQUISHED BY: ①	DATE: TIME:	RECEIVED BY: ②	DATE: TIME:
RELINQUISHED BY: ②	DATE: TIME:	RECEIVED BY: ③	DATE: TIME:
RELINQUISHED BY: ③	DATE: TIME:	RECEIVED BY: ④	DATE: TIME:

METHOD OF SHIPMENT: AIR BILL No.

White –Fully Executed Copy Yellow –Receiving Laboratory Copy Pink –Shipper Copy Goldenrod –Sampler Copy	SAMPLE TEAM:	RECEIVED FOR LABORATORY BY: DATE: ______ TIME: ______

figure E.4.1

TYPICAL CHAIN-OF-CUSTODY RECORD
FAIRBANKS AND OHIO
Chicago, Illinois

CRA

APPENDIX E.A

GAMMA RADIATION LEVEL SURVEY PROCEDURE

1.0 PURPOSE

This procedure provides protocols for gamma radiation level surveys.

2.0 SCOPE

This procedure applies to preparation and surveys including in-situ soil, soil in backhoe buckets or on other equipment that could contain 3 dimensional recesses of soil. Results above the alarm level will be checked by the lead health physicist to ensure the accuracy of the readings. All personnel who use the meter must read and understand sections 1-5 of the Ludlum 193 instruction manual.

Radiation level surveys will be performed at the site as part of the pre-excavation, pre-verification, and verification surveying programs.

3.0 REFERENCES

i) Ludlum 193 Instruction Manual

ii) Eberline ESP-1 Instruction Manual

4.0 EQUIPMENT AND MATERIALS

The following equipment may be used as part of the survey programs. Other equipment maybe substituted if necessary because of the availability of the items listed or the conditions encountered at the site.

- 2-inch by 2-inch NaI(Tl) gamma detector; Ludlum Model 193 survey meter or Eberline ESP-1
- Check Source
- Cables
- Survey Forms

5.0 INSTRUCTIONS FOR RADIOLOGICAL SURVEY

5.1 AREA SURVEY PROCEDURE

1. Two perpendicular baselines will be established at 5 meter intervals.
2. A grid will be established rectilinear from the baseline. If necessary, stakes, survey flags, or paint will be used to delineate individual grid nodes or traverse lines.
3. The baseline, permanent structures, areas of remediation, and other areas of interest will be illustrated in the field logbook.

5.2 GAMMA SURVEY PROCEDURES

1. The Ludlum 193 or Eberline ESP-1 procedures are followed.
2. Hold the NaI(Tl) probe normal to the ground surface at a height of two to six inches.
3. Record results at each grid node.
4. Walk slowly along grid lines at a maximum speed of 0.5 meters per second (~1 miles per hour).
5. Continue the survey until all survey grids have been traversed.
6. Perform off-grid surveys in areas of anomalies.

5.3 RADIOLOGICAL SURVEY OF ON-SITE MATERIALS

1. Material that is excavated and placed in the clean stockpile will have been surveyed twice. The first survey will be performed prior to excavation.
2. The second survey will be performed during excavation of soil. The soils will be surveyed before they are placed in the stockpile. Based on the survey results, the material will either be designated as contaminated material pending transportation and disposal, or tentatively designated as clean and stockpiled for potential use as backfill. In both cases the stockpiled material will be sampled following the Soil Sampling Procedure.

5.4 RADIOLOGICAL SURVEY OF ON-EQUIPMENT MATERIALS

1. Backhoe buckets: Follow Ludlum 193 procedure over the exposed soil. Do not survey through the bucket. If there is more than two feet of soil in the bucket, resurvey the soil after it has been emptied.

5.5 DAILY SURVEYS

1. Routine daily surveys will be performed for each day of the operations at the site.
2. Routine surveys will monitor areas in the immediate vicinity of excavations and along movement paths to ensure that radiation levels are not affected by activities.
3. Routine surveys shall be documented by preparing a drawing of the survey results in the field logbook, indicating either the location and value of the individual measurements or contours of the measured gamma radiation levels.
4. Surveys of the excavation areas will be made at the request of CRA to assess the progress of the removal. These surveys need not be documented and will be used by CRA to manage the excavation.

5.6 PRE-VERIFICATION SURVEY

1. Upon completion of excavation activities a pre-verification survey will be performed to ensure that the excavation is ready for final verification sampling by U.S. EPA and CRA and, to ensure that the excavation is ready for backfill based on U.S. EPA approval.
2. Surveys will be performed as specified in Sections 5.1 and 5.2. Upon completion of the survey and excavation phase, a Notification of Successful Pre-Verification or Verification will be sent to the U.S. EPA requesting approval to backfill.

APPENDIX F

QUALITY ASSURANCE PROJECT PLAN

TABLE OF CONTENTS

TABLE OF CONTENTS

Page

TABLE OF CONTENTS

Page

LIST OF TABLES
(Following Text)

LIST OF ATTACHMENTS

LIST OF ACRONYMS AND SHORT FORMS

CRA	-	Conestoga-Rovers & Associates
DQOs	-	Data Quality Objectives
EDD	-	Electronic Data Deliverable
FSP	-	Field Sampling Plan
MDA	-	Minimum Detectable Activity
pCi/g	-	Picocurie per gram
PARCCS	-	Precision, Accuracy, Representativeness, Comparability, Completeness, Sensitivity
QA	-	Quality Assurance
QA/QC	-	Quality Assurance/Quality Control
QAPP	-	Quality Assurance Project Plan
QC	-	Quality Control
RA	-	Removal Action
RA Work Plan	-	"Removal Action Work Plan, Fairbanks and Ohio Autopark, Chicago, Illinois"
RPD	-	Relative Percent Difference
RSD	-	Relative Standard Deviation
Site	-	East Ohio Street and North Fairbanks Court , Chicago, Illinois
SOP	-	Standard Operating Procedure
U.S. EPA	-	United States Environmental Protection Agency

1.0 INTRODUCTION

The Comprehensive Environmental Response, Compensation and Liability Act requires that investigations performed in a manner consistent with the National Oil and Hazardous Substances Pollution Contingency Plan include a Quality Assurance Project Plan (QAPP). The QAPP is a planning document that provides a "blueprint" for obtaining the type and quantity of data needed to support environmental decision making. The QAPP integrates all technical and quality aspects of a project and documents all quality assurance (QA), quality control (QC), and technical activities and procedures associated with planning, implementing, and assessing environmental data collection operations.

This QAPP has been prepared by Conestoga-Rovers & Associates (CRA) in accordance with the U.S. Environmental Protection Agency (U.S EPA) QAPP guidance documents "EPA Requirements for Quality Assurance Project Plans", EPA QA/R-5, March 2001, "EPA Guidance for Quality Assurance Project Plans", EPA QA/G-5, December 2002, and "Region 5 Instructions on the Preparation of a Superfund Division Quality Assurance Project Plan, Revision 0", June 2000. In accordance with these documents, there are four basic groups of elements that must be included in a QAPP. These four groups and associated elements follow:

- Group A - Project Management. The elements in this group include all aspects of project management, project objectives, and project history.
- Group B – Data Generation and Acquisition. The elements in this group include descriptions of the design and implementation of all measurement systems that will be used during the project.
- Group C – Assessment/Oversight. The elements in this group encompass the procedures used to ensure proper implementation of the QAPP.
- Group D – Data Validation and Usability. The elements in this group cover the QA activities that occur after the data collection phase of the project is completed.

The elements that comprise project management, data generation and acquisition, assessment/oversight, and data validation and usability for the Removal Action (RA) at the property located at the southwest corner of East Ohio Street and North Fairbanks Court in Chicago, Illinois (Property or Site) are documented in this QAPP. This QAPP is Appendix F of "Removal Action Work Plan, Fairbanks and Ohio Autopark, Chicago, Illinois" (RA Work Plan).

2.0 PROJECT MANAGEMENT

The responsibilities of management, QA personnel, field personnel, and laboratory personnel are provided in the following subsections. Additionally, the organization of the project is presented to identify the lines of communication among the participants, and any special training/certification requirements for the project are identified.

2.1 MANAGEMENT RESPONSIBILITIES

Bell Boyd & Lloyd and Funkhouser Vegosen Liebman & Dunn Ltd. ("client group") has retained CRA to develop a work plan for the RA at the Site. CRA has technical responsibility for the data collection activities at the Site. CRA's Project Manager is ultimately responsible for ensuring that the project objectives are achieved. CRA's Project Manager has selected a project team consisting of CRA's technical personnel, QA personnel, and the analytical laboratory. CRA's Project Manager for the RA activities and his specific responsibilities follow.

Bruce Clegg – Project Manager – CRA

- technical representation of project activities for client group
- advise on corrective actions
- review of reports
- final evidence file custodian

CRA's Project Manager will be assisted by CRA's Project Coordinator in the day-to-day management of the project. CRA's Project Coordinator for the RA activities and his specific responsibilities follow.

Julian Hayward – Project Coordinator – CRA

- coordination of CRA's technical group
- overview of field activities
- overview of laboratory activities
- preparation and review of reports

The laboratory's Project Manager is responsible for ensuring that the project objectives are achieved. The laboratory selected for this work is RSSI of Morton Grove, Illinois (RSSI). RSSI's Project Manager and his specific responsibilities follow.

Eli Port – Project Manager – RSSI

- ensures all resources of the laboratory are available on an as-required basis
- reviews final analytical reports
- approves final reports prior to submission to CRA

U.S. EPA will provide oversight of the remediation program, which is being undertaken by the client group on a voluntary basis. U.S. EPA will be represented by Fred Micke, On-Scene Coordinator.

2.2 QUALITY ASSURANCE RESPONSIBILITIES

Project team members with QA responsibilities include CRA's QA Officer, CRA's Field QA Officer, and RSSI's QA Officer. These individuals and their specific responsibilities follow.

Steve Day – Quality Assurance Officer - CRA

- overview and review field QA/QC
- review laboratory QA/QC
- oversee data validation and data assessment
- advise on laboratory corrective action procedures
- prepare and review QA reports
- QA representation of project activities

To be Determined – Field Quality Assurance Officer - CRA

- management of field activities and field QA/QC
- field data assessment
- internal field technical system audits
- technical representation of field activities
- preparation of standard operating procedures (SOPs) for field activities, as necessary
- implementation and documentation of field corrective actions, if necessary

Nina Bijedic – Quality Assurance Officer – RSSI

- coordinate and overview of internal laboratory systems audits
- coordinate QA review of data deliverables
- implement and document laboratory corrective actions, if required
- technical representation of laboratory QA procedures and activities
- oversee preparation of laboratory SOPs

2.3 FIELD RESPONSIBILITIES

CRA will conduct or oversee all field sampling and oversee field measurements during the RA activities. The specific procedures for field sample collection and field measurements are presented in the Field Sampling Plan (FSP), which is Appendix E of the RA Work Plan.

2.4 LABORATORY RESPONSIBILITIES

RSSI will perform the analysis of all samples collected. Specific information regarding the sampling and analysis program is provided in the RA Work Plan and FSP.

The specific responsibilities of other laboratory personnel involved in the project follow.

Roger Marsh – Operations Manager – RSSI

- coordinate laboratory analyses
- supervise in-house chain-of-custody
- schedule sample analyses
- oversee data review
- oversee preparation of analytical reports

Roger Marsh – Sample Custodian – RSSI

- receive and inspect the incoming sample containers
- record the condition of incoming sample containers
- sign appropriate documents

- verify correctness of chain-of-custody documentation
- notify Project Manager of any non-conformances identified during sample receipt and inspection
- assign a unique identification number to each sample, and record client information and sample identification numbers in the sample receiving log
- control and monitor access/storage of samples

2.5 PROJECT ORGANIZATION

The organization and lines of communication among project participants is presented on Figure 4.1 of the RA Work Plan.

2.6 PROBLEM DEFINITION/BACKGROUND INFORMATION

The purpose of the sampling and analysis program is to identify soil/fill material that is impacted with radioactive materials for removal and disposal at a suitable disposal facility.

2.7 PROJECT/TASK DESCRIPTION AND SCHEDULE

The scope of work for the soil removal and restoration is provided in Section 4.0 of the RA Work Plan. The sampling and analysis program developed for this scope of work is summarized in Table 2.1. Target analytes are identified in Table 2.2.

2.7.1 PROJECT SCHEDULE

The project schedule is discussed in the RA Work Plan.

2.8 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

The data quality objectives and measurement performance criteria for the project are presented in the following subsections.

2.8.1 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are qualitative and quantitative statements derived from the outputs of each step of the DQO process. The DQO process is a series of planning steps based on the scientific method that is designed to ensure that the type, quantity, and quality of environmental data used in decision making are appropriate for the intended application.

There are seven steps in the DQO process that include:

1. stating the problem;
2. identifying the decision;
3. identifying inputs to the decision;
4. defining the boundaries of the study;
5. developing a decision rule;
6. specifying limits on decision errors; and
7. optimizing the design for obtaining data.

The details of DQO process for the project are provided below.

The problem is soil/fill at the Site may contain levels of radioactivity above the U.S. EPA local action level.

The decision is whether or not soil/fill exceeds the U.S. EPA local action level of 7.1 picocuries/gram (pCi/g) as total radium.

The inputs to the decision are the data from previous investigations at the Site (refer to Section 4.1 and Figure 3.3 of the RA Work Plan) and the U.S. EPA local action level of 7.1 pCi/g (total radium).

The spatial boundary is the estimated extent of soil contamination indicated on Figure 3.3 of the RA Work Plan. The temporal boundary for the project is the on-Site activities anticipated to occur in 2004. The only practical constraint for the sampling activities are possible accessibility issues with respect to sample collection locations.

The decision rule for the soil removal and restoration program is if confirmation testing of excavated areas indicate the level of radioactivity is less than the U.S. EPA local action level of 7.1 pCi/g (total radium), the removal of soil/fill is complete.

The limits on the probability of decision errors will be set at 0.10.

The sampling and analysis program has been designed to ensure that the problem identified above can be solved in a resource-efficient and timely manner. The scope of work for the soil removal and restoration is provided in Section 4.0 of the RA Work Plan.

2.8.2 MEASUREMENT PERFORMANCE CRITERIA

The measurement performance criteria for precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) are provided in the following subsections.

2.8.2.1 FIELD PRECISION CRITERIA

Precision of field surveys will be assessed as described in the Ludlum 193 survey SOP provided in Attachment A.

Precision of the field sample collection procedures will be assessed by the data from analysis of field duplicate samples. Relative percent differences (RPDs) will be calculated for detected analytes from investigative and field duplicate samples. Field duplicate samples will be collected at a frequency of 1 per 20 or fewer investigative samples. An RPD of 50 percent will be used as an advisory limit for each analyte detected in both the investigative and field duplicate samples at concentrations greater than or equal to 50 times its minimum detectable activity (MDA). Professional judgment will be used to qualify associated sample data.

2.8.2.2 LABORATORY PRECISION CRITERIA

Laboratory precision will be assessed as described in the Gamma Spectroscopy Analysis SOP provided in Attachment A.

2.8.2.3 FIELD ACCURACY CRITERIA

Accuracy of field surveys will be assessed as described in the Ludlum 193 survey SOP provided in Attachment A.

2.8.2.4 LABORATORY ACCURACY CRITERIA

Accuracy of laboratory analyses will be assessed as described in the Gamma Spectroscopy Analysis SOP provided in Attachment A.

2.8.2.5 FIELD REPRESENTATIVENESS CRITERIA

Representativeness is dependent upon the proper design of the sampling program. The representativeness criteria for field sampling will be to ensure that the samples are collected from the correct locations and the sampling procedures in the FSP are followed.

2.8.2.6 LABORATORY REPRESENTATIVENESS CRITERIA

The representativeness criteria for laboratory data will be to ensure that the proper analytical procedures are used for sample analysis. Additionally, the accuracy and precision of the laboratory data affect representativeness. The laboratory representativeness criteria will include achieving the accuracy and precision criteria for the sample analyses.

2.8.2.7 FIELD COMPARABILITY CRITERIA

The criteria for field comparability will be to ensure and document that the sampling procedures in the FSP are followed.

2.8.2.8 LABORATORY COMPARABILITY CRITERIA

The criteria for laboratory data comparability will be to ensure that the analytical method used for sample analysis is comparable to the methods used for previous sampling events conducted by others, as applicable.

2.8.2.9 FIELD COMPLETENESS CRITERIA

The criteria for field completeness will be that a minimum of 90 percent of the field-measured data are valid. The procedure for determining field data validity is provided in Section 3.9.2 of this QAPP. The equation for calculating completeness is presented in Section 5.3.4 of this QAPP.

2.8.2.10 LABORATORY COMPLETENESS CRITERIA

The criteria for laboratory completeness will be that a minimum of 90 percent of the laboratory data are determined to be valid (usable) for the intended purpose. The procedure for determining laboratory data validity is provided in Section 3.9.2 of this QAPP. The equation for calculating completeness is presented in Section 5.3.4 of this QAPP.

2.8.2.11 FIELD SENSITIVITY CRITERIA

The criteria for field measurement sensitivity are provided in the FSP.

2.8.2.12 LABORATORY SENSITIVITY CRITERIA

The sensitivity requirements for the laboratory analyses are provided in the SOP in Attachment A. The analytical method selected for this project is sufficiently sensitive to achieve the U.S. EPA local action level of 7.1 pCi/g (total radium).

2.9 SPECIAL TRAINING/CERTIFICATION REQUIREMENTS

All on-Site personnel are required to have received the 40-hour Hazardous Waste Operations and Emergency Response safety training and annual 8-hour refresher courses required by 29 CFR Parts 1910 and 1926. On-Site personnel also are required to complete radiation safety training in compliance with 32 IAC 400.

2.10 DOCUMENTATION AND RECORDS

The documents, records, and reports generated during the project are identified in the following subsections.

2.10.1 FIELD AND LABORATORY RECORDS

Documents and records generated during the project include sample collection records, QC sample records, field measurement records, laboratory records, and data handling records. A brief description of these documents and records are provided below. Detailed information regarding these records is provided in subsequent sections of this QAPP.

Sample collection records that will be generated during the sampling activities include field logbooks, chain-of-custody records, and shipping papers.

QC sample records that will be generated during the project to document QC sample collection include field logbooks for recording field duplicate samples. RSSI will maintain sample integrity information.

Field measurements will be recorded in bound logbooks or on standard field forms. Calibration data, where applicable, will also be recorded in these logbooks or on these forms.

Laboratory records that will be maintained for the project include sample receipt documentation, field and laboratory chain-of-custody documentation, reagent and standard reference material certifications, sample preparation records, sample analysis records (e.g., run logs), instrument/raw data, QC data, calibration data, corrective action reports, and final reports.

Data handling records that will be maintained include verification of computer programs used to manipulate or reduce raw data into final results and data validation reports. RSSI will maintain documentation of data verification and reduction procedures, as necessary, for the analyses conducted during the project. CRA will maintain checklists, notes, and reports generated during the external data validation process.

2.10.2 DATA REPORTING FORMAT

Field data will be recorded in bound logbooks or on standard forms. The details for recording field data are provided in Section 3.2.2.1 of this QAPP. Field data will be generated primarily from direct-reading meters or will consist of field readings or observations. These data will be tabulated and included in project reports or submittals, as necessary.

Laboratory reports for the analyses will consist of a summary report with applicable QC data. Raw data, MDA studies, and method performance and validation studies will be maintained by RSSI.

2.10.3 DATA ARCHIVING AND RETRIEVAL

All records will be maintained for a period of 7 years following completion of the RA.

3.0 DATA GENERATION AND ACQUISITION

The design and implementation of the measurement systems that will be used, including sampling procedures, analytical procedures, and data handling and documentation are detailed in the following subsections.

3.1 SAMPLING PROCESS DESIGN

The rationale for sampling program is provided in the FSP and Section 4.0 the RA Work Plan.

3.1.1 SAMPLING METHODS

Sampling methods are provided in the FSP.

3.1.2 FIELD EQUIPMENT AND SAMPLE CONTAINER CLEANING PROCEDURES

Field equipment cleaning procedures are provided in the FSP. All sample containers will be provided by RSSI.

3.1.3 FIELD EQUIPMENT MAINTENANCE, TESTING, AND INSPECTION REQUIREMENTS

Field equipment will be inspected and tested prior to being shipped to the field. Maintenance logs for all field equipment will be maintained by RSSI. All equipment shipped back from the field is inspected and tested upon return. Any required maintenance is performed and documented prior to the equipment being returned to service.

3.1.4 INSPECTION AND ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND SAMPLE CONTAINERS

The field supplies for the project consist of sample containers to collect the samples. Sample containers will be provided by RSSI, as discussed in Section 3.1.2. RSSI's QA

Officer is ultimately responsible for ensuring that sample containers are acceptable for the project. The acceptability of sample containers for use will be evaluated by reviewing lot analysis certificates, as applicable. Containers that do not meet RSSI's acceptability requirements will not be shipped to the field.

3.2 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

The procedures for sample handling, labeling, shipping, and chain-of-custody documentation are provided in the subsections that follow.

3.2.1 SAMPLE HANDLING

The procedures used to collect samples are provided in Section 3.2 of the FSP. The sample numbering system for the project is provided in Section 4.2 of the FSP. Field duplicate samples will be numbered using this system to prevent laboratory bias of field QC samples.

3.2.2 SAMPLE CUSTODY

Chain of custody is the sequence of possession of an item. An item (such as a sample or final evidence file) is considered to be in a person's custody if the item is in actual possession of a person, the item is in the view of the person after being in his/her actual possession, or the item was in a person's physical possession but was placed in a secure area by that person. Field, laboratory, and final evidence file custody procedures are described in the subsections that follow.

3.2.2.1 FIELD CUSTODY PROCEDURES

Logbooks will used to record field data collection activities. Entries into field logbooks will be described in as much detail as possible to ensure that a particular situation could be reconstructed solely from logbook entries. Field logbooks will be bound field survey books or notebooks with consecutively numbered pages. Logbooks will be assigned to field personnel and will be stored at CRA's Chicago, Illinois office when not in use. Each logbook will be identified by the project-specific document number (017770).

The title page of each logbook will contain the following information:

- person to whom the logbook is assigned;
- logbook number;
- project name;
- project start date; and
- end date.

Entries into the logbook will contain a variety of information. At the beginning of each day's logbook entry, the date, start time, weather conditions, and the names of all sampling team members present will be entered. The names of individuals visiting the Site or field sampling team and the purpose of their visit will also be recorded in the field logbook.

All field measurements obtained and samples collected will be recorded. All logbook entries will be made in ink, signed, and dated with no erasures. If an incorrect logbook entry is made, the incorrect information will be crossed out with a single strike mark that is initialed by the person making the erroneous entry. The correct information will be entered into the logbook adjacent to the original entry.

Whenever a sample is collected or a measurement is made, a detailed description of the location will be recorded in the logbook. Photographs taken at a location, if any, will also be noted in the logbook. All equipment used to obtain field measurements will be recorded in the field logbook. In addition, the calibration data for all field measurement equipment will be recorded in the field logbook or on standard field forms.

Samples will be collected following the sampling procedures documented in the FSP. The time of sample collection, sample description, and volume and number of containers will be recorded in the field logbook. Each sample will be uniquely identified using the sample numbering system provided in the FSP.

The packaging and shipping procedures summarized below will ensure that the chain of custody of samples collected for analysis remains intact:

1. The field sampler is personally responsible for the care and custody of the samples until they are transferred to another person or the laboratory. As few people as possible will handle the samples.

2. All sample containers will be identified by using sample labels that include the date of collection and analyses to be performed. Sample labels will be completed for each sample using waterproof ink.
3. Samples will be accompanied by a properly completed chain-of-custody form. The sample identification numbers and required analyses will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving the samples will sign and record the date and time on the form. The chain-of-custody form documents sample custody transfers from the sampler to another person, to the laboratory, or to/from a secure storage area. An example chain-of-custody record form is provided as Figure E.4.1 in the FSP.
4. Samples will be properly packaged for shipment and dispatched to the laboratory for analysis with a separate signed chain-of-custody form enclosed in each shipping container. Shipping containers will be secured with custody tape for shipment to the laboratory. The custody tape is covered with clear plastic tape to prevent accidental damage to the custody tape.
5. If samples are collocated with a government agency or other entity, it is the responsibility of that entity to prepare its own chain-of-custody form for the samples. Information regarding the identity of the entity and the samples that are being collocated will be recorded in the field logbook.
6. All sample shipments will be accompanied by the chain-of-custody form identifying its contents. The chain-of-custody form is a four part carbonless-copy form. The form is completed by the sampling team which, after signing and relinquishing custody to the shipper, retains the bottom (goldenrod) copy. The shipper, if different than the sampling team members, retains the pink copy after relinquishing custody to the laboratory. The yellow copy is retained by the laboratory and the fully executed white copy is returned as part of the data deliverables package.
7. If the samples are sent by common carrier, a bill of lading (e.g., FedEx airbill) will be used and copies will be retained as permanent documentation. Commercial carriers are not required to sign the chain-of-custody form as long as the form is sealed inside the shipping container and the custody tape remains intact.

3.2.2.2 LABORATORY CUSTODY PROCEDURES

Laboratory sample custody begins when the samples are received at the laboratory. The field sample identification numbers, laboratory sample identification numbers, date and time of sample collection, date and time of sample receipt, and requested analyses will be entered into the sample receiving log.

Following log-in, all samples will be stored within an access-controlled location and will be maintained until completion of all laboratory analyses. Unused sample aliquots and sample extracts will be maintained for a minimum of 30 days following receipt of the final report by CRA. RSSI will be responsible for the disposal of unused sample aliquots and sample containers in accordance with all applicable local, state, and federal regulations.

RSSI will be responsible for maintaining analytical logbooks and laboratory data. All laboratory records will be maintained consistent with the record retention requirements in Section 2.10.3 of this QAPP.

3.2.2.3 FINAL EVIDENCE FILES CUSTODY PROCEDURES

The final evidence file for the project will be maintained by CRA and will consist of the following:

1. project plan;
2. project log books;
3. field data records;
4. sample identification documents;
5. chain-of-custody records;
6. correspondence;
7. references, literature;
8. final data packages;
9. miscellaneous - photos, maps, drawings, etc.; and
10. final report.

The final evidence file materials will be the responsibility of the evidentiary file custodian (CRA's Project Manager) with respect to maintenance and document removal.

3.3 ANALYTICAL METHOD REQUIREMENTS

The field and laboratory analytical methods that will be used during the investigation are detailed in the following subsections.

3.3.1 FIELD ANALYTICAL METHODS

The SOP for field gamma radiation level surveys is provided in Attachment A.

3.3.2 LABORATORY ANALYTICAL METHODS

The SOP for gamma spectroscopy analysis that will be used to analyze confirmation soil samples is presented in Attachment A.

3.4 QUALITY CONTROL REQUIREMENTS

The field and laboratory QC requirements for the project are discussed in the following subsections.

3.4.1 FIELD SAMPLING QUALITY CONTROL

Field QC requirements include analyzing reference standards for instrument calibration and for routine calibration checks. Field QC samples for this project include field duplicate samples to assess the overall precision of the sampling and analysis event. The frequency of collection for these field QC samples was provided in Section 2.8 of this QAPP. The evaluation of field QC data is provided in Section 3.9.2 of this QAPP.

3.4.2 ANALYTICAL QUALITY CONTROL

The laboratory QC requirements are in RSSI's SOP in Attachment A.

3.5 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

The procedures used to verify that instruments and equipment are functional and properly maintained are described in the following subsections.

3.5.1 FIELD INSTRUMENT MAINTENANCE

Specific preventive maintenance procedures to be followed for field equipment are those recommended by the manufacturer.

3.5.2 LABORATORY INSTRUMENT MAINTENANCE

As part of its QA/QC program, RSSI conducts routine preventive maintenance to minimize the occurrence of instrument failure and other system malfunctions. Designated laboratory employees will regularly perform routine scheduled maintenance and repair of (or coordinate the repair of) all instruments. All maintenance that is performed is documented in the laboratory's maintenance logbooks. All laboratory instruments are maintained in accordance with manufacturer's specifications.

3.6 CALIBRATION PROCEDURES AND FREQUENCY

The procedures for maintaining the accuracy of all the instruments and measuring equipment that are used for conducting field tests and laboratory analyses are described in the following subsections. These instruments and equipment will be calibrated prior to each use or according to a periodic schedule.

3.6.1 FIELD INSTRUMENTS/EQUIPMENT

Equipment to be used during field sampling will be examined to confirm that it is in operating condition. This includes checking the manufacturer's operating manual to ensure that all maintenance requirements are being observed. Individual calibration records will be reviewed to ensure that any prior equipment problems have not been overlooked and all necessary repairs to equipment have been completed.

3.6.2 LABORATORY INSTRUMENTS

Calibration of laboratory equipment will be based on approved written procedures. Records of calibration, repairs, or replacement will be filed and maintained by the designated laboratory personnel performing these quality control activities. These records generally will be filed at the location where the work is performed and will be subject to QA audit. For all instruments, the laboratory will maintain a properly trained repair staff with in-house spare parts or will maintain service contracts with vendors. Specific calibration procedures and frequencies are detailed in RSSI's SOP.

3.7 INSPECTION/ACCEPTANCE CRITERIA FOR SUPPLIES AND CONSUMABLES

The procedures that will be used to ensure that supplies and consumables used in the field and laboratory will be available as needed and free of contaminants are detailed in the following subsections.

3.7.1 FIELD SUPPLIES AND CONSUMABLES

Supplies and consumables for field measurements and sampling will be obtained from various vendors and include calibration solutions, sample containers, and detergent and distilled water for field instrument cleaning. Additional field supplies and consumables include personnel protective equipment. All field supplies will be consumed or replaced with sufficient frequency to prevent deterioration or degradation that may interfere with the analyses.

3.7.2 LABORATORY SUPPLIES AND CONSUMABLES

Vendors for general labware and reagents used by RSSI include GA-MA Associates, Inc. RSSI's QA Officer is ultimately responsible for the ensuring the acceptability of supplies and consumables.

3.8 DATA ACQUISITION REQUIREMENTS (NON-DIRECT MEASUREMENTS)

Historical data have been generated during sampling events by others. These data are usable for quantitative and qualitative purposes.

3.9 DATA MANAGEMENT

The procedures for managing data from generation to final use and storage are detailed in subsections that follow.

3.9.1 DATA RECORDING

Field data will be recorded in field logbooks and consist of measurements from direct-reading instruments or direct measurements. Field staff are responsible for recording field data, and the Field QA Officer is responsible for identifying and correcting any recording errors.

Laboratory data are recorded in a variety of formats. Data from instruments are recorded on magnetic media, strip charts, or bench sheets. RSSI's SOP provides the data recording requirements.

3.9.2 DATA VALIDATION

Validation of field data for this project will primarily consist of checking for transcription errors and review of data recorded in field logbooks. Data transcribed from the field logbook into summary tables for reporting purposes will be verified for correctness by the Field QA Officer or his designee. Any limitations on the use of field data will be included in the reports.

Validation of the laboratory data will be performed by CRA's QA Officer or his designee based on the measurement performance criteria specified in this QAPP. Data validation will be performed on 100 percent of the data. The results of the data validation process will be documented in a memorandum that specifies all limitations on the usability of the analytical data.

3.9.3 DATA TRANSFORMATION/DATA REDUCTION

Field data reduction procedures will be minimal in scope compared to those implemented for laboratory data. Only direct-reading instrumentation will be employed in the field. These data will be recorded in field logbooks or on standard forms immediately after the measurements are obtained.

Laboratory data reduction procedures typically will be conducted according to the following protocol:

1. Raw data produced and checked by the responsible analyst is turned over for independent review by another analyst.
2. The area supervisor or senior chemist reviews the data for attainment of QC acceptance criteria.
3. The area supervisor will decide whether any sample re-analysis is required.
4. Upon completion of all reviews and acceptance of the raw data by the area supervisor, a report will be generated and sent to the laboratory Project Manager.
5. The laboratory Project Manager will complete a thorough inspection of all reports.
6. Following review and approval of the preliminary report by the laboratory Project Manager, final reports will be generated and signed.

3.9.4 DATA TRANSMITTAL/TRANSFER

Field measurements will be entered into a standard Microsoft Excel spreadsheet format, as necessary. CRA's Field QA Officer is responsible for verifying the correctness of the field data after the data are transferred to a spreadsheet format. Geographical and field data are maintained in a database that is described below.

Electronic data deliverables (EDDs) will be provided by RSSI in a format compatible with EarthSoft's EQuIS database product. EQuIS uses Microsoft Access as its database. EDDs are imported into EQuIS, and the data are maintained in the database for manipulation and presentation.

CRA's QA Officer is responsible for verifying the correctness of the analytical database after the laboratory data have been imported. This is accomplished by comparing the data from the database to the hardcopy analytical reports for a minimum of 10 percent of the sample results. If discrepancies between the database and hardcopy analytical reports are identified, a complete verification of the database will be performed or a new EDD will be submitted, imported, and verified as described previously.

3.9.5 DATA ANALYSIS

The data from the sampling and analysis program will be compared to U.S. EPA's local action level of 7.1 pCi/g (total radium).

3.9.6 DATA ASSESSMENT

Assessment of laboratory data by RSSI will be performed using the procedures detailed in its SOP. These assessments may include determining the mean, standard deviation, percent relative standard deviation (RSD), percent difference, RPD, and percent recovery for certain QC elements.

Assessment of QC data for data validation purposes may include determining the mean, standard deviation, percent RSD, percent recovery, RPD, and percent completeness. The statistical equations to determine percent recovery, RPD, and percent completeness are provided in Section 5.3 of this QAPP.

3.9.7 DATA TRACKING

Data generated in the field will be recorded in field logbooks or on standard field forms. There are no unique or special tracking requirements for these data. The data will be transcribed for analysis and reporting as discussed in Section 3.9.3, and field logbooks will be maintained in the final evidence file.

Laboratory data tracking procedures will be consistent with RSSI's standard procedures for tracking data from generation to reporting. RSSI's Operations Manager is ultimately responsible for data tracking in the laboratory.

Tracking analytical data in the EQuIS database includes recording the laboratory generating the data, the date when the EDD was received and imported, the date when qualifiers were applied to the results, and the level of data validation performed. CRA's

Project Manager is ultimately responsible for tracking data from entry into the database to reporting.

3.9.8 DATA STORAGE AND RETRIEVAL

Laboratory data will be stored in hardcopy format for a minimum period of 7 years. CRA's Project Manager is responsible for project data storage and retrieval. Final evidence files will be maintained by CRA.

3.9.9 DATA SECURITY

Laboratory data security is the responsibility of RSSI's Operations Manager. Archived data cannot be accessed without authorization, and the name and purpose of personnel accessing archived data are recorded. CRA's data security procedures include limiting project database access to database managers and analysts and general building security procedures.

4.0 ASSESSMENT/OVERSIGHT

The following subsections describe the procedures used to ensure proper implementation of this QAPP and the activities for assessing the effectiveness of the implementation of the project and associated QA/QC activities.

4.1 ASSESSMENTS AND RESPONSE ACTIONS

Assessments consisting of internal and external audits will be performed during the project. Internal technical system audits of both field and laboratory procedures will be conducted to verify that sampling and analysis are being performed in accordance with the procedures established in the RA Work Plan, FSP, and QAPP.

An internal field technical system audit of field activities, including sampling and field measurements, will be conducted by the Field QA Officer or his designee at the beginning of the field sampling activities to identify deficiencies in the field sampling and documentation procedures. The field technical system audit will include examining field sampling records, field instrument operating records, field instrument calibration records, and chain-of-custody documentation. In addition, sample collection, handling, and packaging in compliance with the established procedures will be reviewed during the field audit. Any deficiencies identified will be documented and corrective actions will be taken to rectify the deficiencies.

Corrective action resulting from internal field technical system audits will be implemented immediately if data may be adversely affected from the use of unapproved or improper use of approved methods. CRA's Field QA Officer will identify deficiencies and recommend corrective action to CRA's Project Manager. Implementation of corrective actions will be performed by the Field QA Officer and field team. Corrective action will be documented in the field logbook and/or the project file. Follow-up audits will be performed as necessary to verify that deficiencies have been corrected, and that the QA/QC procedures described in this QAPP and the Work Plan are maintained throughout the project.

An external field technical system audit may be conducted at the discretion of U.S. EPA at any time during the field operations. These audits may or may not be announced by U.S. EPA.

An internal laboratory technical system audit will be conducted by RSSI's QA Officer or designee. The laboratory technical system audit generally is conducted on an annual basis and includes examining laboratory documentation regarding sample receiving, sample log-in, storage and tracking, chain-of-custody procedures, sample preparation and analysis, instrument operating records, data handling and management, data tracking and control, and data reduction and verification. The laboratory QA Officer will evaluate the results of the audit and provide a final report to section managers and the Operations Manager that includes any deficiencies and/or noteworthy observations.

Corrective action resulting from deficiencies identified during the internal laboratory technical system audit will be implemented immediately. The Operations Manager or section leaders, in consultation with the laboratory supervisor and staff, will approve the required corrective action to be implemented by the laboratory staff. The laboratory QA Officer will ensure implementation and documentation of the corrective action. All problems requiring corrective action and the corrective action taken will be reported to the laboratory Project Manager. Follow-up audits will be performed as necessary to verify that deficiencies have been corrected, and that the QA/QC procedures described in this QAPP are maintained throughout the project.

An external laboratory technical system audit may be conducted at the discretion of U.S. EPA personnel. These audits may or may not be announced by U.S. EPA.

4.2 REPORTS TO MANAGEMENT

Quality assurance information will be summarized and provided to management following completion of the RA activities. This information will be included in the final RA report and consist of the results of external system audits (if performed by U.S. EPA), results of periodic data quality validation and assessment, data use limitations, and any significant QA problems identified and corrective actions taken.

CRA's QA Officer will be responsible within the organizational structure for compiling this information. CRA's Project Manager will be provided with this information to be included in the QA/QC section of the final RA report. This section will summarize data quality information and provide an overall data quality assessment compared to the data quality objectives outlined in this QAPP.

5.0 DATA VERIFICATION/VALIDATION AND USABILITY

The QA activities that will be performed to ensure that the data are scientifically defensible, properly documented, of known quality, and meet the project objectives are described in the following sections.

5.1 DATA REVIEW, VERIFICATION, AND VALIDATION REQUIREMENTS

All field and laboratory data will be reviewed and verified/validated. The procedures and criteria used to verify and validate field and laboratory data will consist of evaluating the data to the measurement performance criteria in Section 2.8.2 of this QAPP. Field data and logbooks will be reviewed to ensure that the requirements of the sampling program, including the number of samples and locations, sampling, and sample handling procedures, were fulfilled.

Sample collection procedures will be reviewed for compliance with the requirements of the FSP and QAPP. If alternate sampling procedures were used, the acceptability of the procedure will be evaluated to determine the affect on the usability of the data. Data usability will not be affected if the procedure used is determined to be an acceptable alternative that fulfills the measurement performance criteria in Section 2.8.2 of this QAPP. However, data generated from sampling procedures that do not provide representative samples will be rejected.

Sample handling records will be reviewed to ensure that sample integrity remained intact from collection to laboratory receipt. Chain-of-custody documentation and sample condition upon laboratory receipt will be reviewed. The data from samples for which the chain of custody or sample identification cannot be verified will be rejected.

Field and laboratory data will be verified to ensure that the methods used to analyze the samples were consistent with the requirements of this QAPP. Data generated from the use of unapproved methods will be rejected. Acceptable departures from the methods specified in this QAPP include using an alternate field meter of comparable capability if the specified meter becomes inoperable or is unavailable.

QC data will be reviewed to determine compliance with the acceptance criteria in Section 2.8.2 of this QAPP. QC data that do not meet the acceptance criteria will result in sample data qualification.

5.2 VERIFICATION AND VALIDATION METHODS

Field data will be verified by reviewing field documentation and chain-of-custody records. Data from direct-reading field instruments will be internally verified by reviewing calibration and operating records. RSSI will internally verify its data by reviewing and documenting sample receipt, sample preparation, sample analysis (including internal QC checks), and data reduction and reporting. Any deviations from the acceptance criteria, corrective actions taken, and data determined to be of limited usability (i.e., laboratory-qualified data) will be noted in the laboratory reports.

Data validation will be conducted by CRA consistent with the procedure identified in Section 3.9.2 of this QAPP. The data verification/validation procedure will identify data as being acceptable, of limited usability (qualified as estimated), or unusable. The results of the data verification/validation will be provided in data validation memoranda that are provided to CRA's Project Manager.

Data determined to be unusable may require corrective action to be taken. Potential types of corrective action may include resampling by the field team or reanalysis of samples by the laboratory. The corrective actions taken are dependent upon the ability to mobilize the field team and whether or not the data are critical for project DQOs to be achieved. Should CRA's QA Officer identify a situation requiring corrective action during data verification/validation, CRA's Project Manager will be responsible for approving the implementation of the corrective action.

5.3 USABILITY/RECONCILIATION WITH DATA QUALITY OBJECTIVES

The overall usability of the data for the investigation will be assessed by evaluating the PARCCS of the data set to the measurement performance criteria in Section 2.8.2 of this QAPP using basic statistical quantities, as applicable. The procedures and statistical formulas to be used for these evaluations are presented in the following subsections.

5.3.1 PRECISION

Project precision will be evaluated by assessing the RPD data from field duplicate samples. Analytical precision will be evaluated by assessing the RPD data from either duplicate spiked sample analyses or duplicate sample analyses. The RPD between two measurements is calculated using the following simplified formula:

$$RPD = \frac{|R_1 - R_2|}{R_1 + R_2} X \ 200$$

where:

R_1 = value of first result
R_2 = value of second result

Overall precision for the sampling program will be determined by calculating the mean RPD for all field duplicates. This will provide an evaluation of the overall variability attributable to the sampling procedure, sample matrix, and laboratory procedures in each sampling program.

The overall precision requirement will be the same as the project precision. It should be noted that the RPD of two measurements can be very high when the data approach the quantitation limit of an analysis. The calculation of the mean RPD will only include the RPD values for field duplicate sample analyte data that are greater than or equal to 50 times the MDA for an analysis.

5.3.2 ACCURACY/BIAS

The data from standard reference material (SRM) will be used to determine accuracy and potential bias of the sample data. The percent recovery for SRMs are determined by dividing the measured value by the true value and multiplying by 100.

Overall accuracy/bias for the sampling events will be determined by calculating the percent of accuracy measurements that meet the measurement performance criteria specified in Section 2.8.2 of this QAPP. Overall accuracy will be considered acceptable if the SRM percent recoveries are met for at least 75 percent of the samples.

5.3.3 SAMPLE REPRESENTATIVENESS

Representiveness of the samples will be assessed by reviewing the results of field audits and the data from field duplicate samples. Overall sample representativeness will be determined by calculating the percentage of field duplicate sample data that achieved the

RPD criteria specified in Section 2.8.2 of this QAPP. Overall sample representativeness will be considered acceptable if the results of field audits indicate that the approved sampling methods or alternate acceptable sampling methods were used to collect the samples and the field duplicate RPD data are acceptable for at least 75 percent of the samples.

5.3.4 COMPLETENESS

Completeness will be assessed by comparing the number of valid (usable) sample results to the total possible number of results within a specific sample matrix and/or analysis. Percent completeness will be calculated using the following formula:

$$\%\ \text{Completeness} = \frac{\text{Number of Valid (usable) measurements}}{\text{Number of Measurements Planned}} \times 100$$

Overall completeness will be assessed by calculating the mean percent completeness for the entire set of data obtained for the sampling program. The overall completeness will be calculated when all sampling and analysis is concluded. Overall completeness will be considered acceptable if at least 90 percent of the data are determined to be valid.

5.3.5 COMPARABILITY

The comparability of data sets will be evaluated by reviewing the sampling and analysis methods used to generate the data for each data set. Project comparability will be determined to be acceptable if the sampling and analysis methods specified in this QAPP and any approved QAPP revisions or amendments are used for generating the data.

5.3.6 SENSITIVITY AND DETECTION LIMITS

The detection limits for the sample data will be reviewed to ensure that the sensitivity of the analyses was sufficient to achieve the detectability requirements specified for the project. Background data and SRM percent recovery data will be reviewed to assess compliance with the measurement performance criteria specified in Section 2.8.2 of this QAPP.

Overall sensitivity will be assessed by comparing the sensitivity achieved for the samples to the detectability requirements for the analyses. Overall sensitivity will be considered acceptable if detection limits for the samples are sufficient to achieve the detectability requirements for the project.

It should be noted that detection limits may be elevated as a result of high concentrations of target analytes, non-target analytes, and matrix interferences (collectively known as sample matrix effects). In these cases, the sensitivity of the of the analyses will be evaluated on an individual sample basis relative to the applicable evaluation criteria. The need to investigate the use of alternate analytical methods may be required if the sensitivity of the analytical methods identified in this QAPP cannot achieve the evaluation criteria as a result of sample matrix effects.

5.3.7 DATA LIMITATIONS AND ACTIONS

Data use limitations will be identified in data quality assessment reports. Data that do not meet the measurement performance criteria specified in this QAPP will be identified and the impact on the project quality objectives will be assessed and discussed in these reports. Specific actions for data that do not meet the measurement performance criteria depends on the use of the data, and may require that additional samples be collected or the use of the data be restricted.

TABLE 2.1

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
FAIRBANKS AND OHIO AUTOPARK
CHICAGO, ILLINOIS

Task [1]	*Field Parameters*	*Laboratory Parameters* [2]	*Investigative Samples*	*QC Samples* *Field Duplicates*	*Total* [3]
Pavement Removal and Soil Excavation Survey	Field Survey	None	0	0	0
Confirmation Sampling - Stockpiled Material	None	Gamma Spectroscopy	1 per 100 yd^3	1 per 20	TBD
Confirmation Sampling - Base of Excavation	None	Gamma Spectroscopy	1 per 100 m^2	1 per 20	TBD

[1] Walkover surveys will be conducted during pavement removal and soil excavation. These surveys will be conducted using a 5-meter grid, and gamma radiation readings will be recorded at each grid node.
[2] Confirmation samples will be analyzed by gamma spectroscopy to determine radiation levels relative to the 7.1 pCi/g (total radium) criterion.
[3] TBD - To be determined based on the volume of excavated material and size of excavation

TABLE 2.2

TARGET ANALYTES, DETECTION LIMITS, AND REMEDIATION GOALS
FAIRBANKS AND OHIO AUTOPARK
CHICAGO, ILLINOIS

Analyte	*Targeted Detection Limit*[1] *(pCi/g)*	*Remediation Goal (pCi/g)*
Total Radium (by surrogates)	0.1 Pb-214; 0.4 Ac-228 (0.5 total)	7.1

[1] Results for actual soil samples will be reported on as-received basis.

ATTACHMENT A

GAMMA SPECTROSCOPY AND LUDLUM 193 STANDARD OPERATING PROCEDURES

Gamma Spectroscopy Analysis Procedures

1.0 PURPOSE

This procedure provides protocols for gamma spectroscopy analysis using a Multi-Channel Analyzer. High resolution gamma spectroscopy is used to provide qualitative and quantitative data for samples containing gamma emitting radionuclides. This procedure describes the general operational steps, analysis, and calibration.

2.0 SCOPE

This procedure applies to high-resolution gamma spectroscopy. Gamma spectroscopy analyzes photon spectrums from samples by measuring the energy distribution and quantity of gamma radiations. This procedure uses the key line method to simplify analysis of Ra-226 and Ra-228 surrogates, namely Pb-214 and Ac-228, respectively.

3.0 REFERENCES

3.1 Germanium detector manual
3.2 Preamplifier manual
3.3 Amplifier manual
3.4 MCA manual
3.5 High Voltage power supply manual
3.6 Bias protection manual
3.7 Data reduction software manual

4.0 REQUIREMENTS

4.1 Materials and equipment
The following equipment may be used as part of the analysis.

4.1.1 High-Purity Germanium (HPGe) detector
4.1.1.1. Preamplifier
4.1.1.2 Capsule
4.1.1.3 Cryostat
4.1.2 Amplifier
4.1.3 High voltage supply
4.1.4 Bias protection module
4.1.5 GDR software
4.1.6 Standard and constancy sources
4.1.6.1 Multi-energy standard
4.1.6.2 Am-241, CS-137, and Co-60 constancy sources
4.1.7 Cables
4.1.8 Task-specific key line library for radium surrogates

4.2 General

4.2.1 Constancy check will be performed daily.

4.2.2 A standard source will be used for calibration prior to this application.

5.0 INSTRUCTIONS

5.1. Daily checks

5.1.1. Place the check sources on the detector.

5.1.2. Select the "Ctrl" and "F2" keys to delete all spectra.

5.1.3. Select the "F3" key to set time for 600 seconds.

5.1.4. Select the "F1" key to begin acquisition.

5.1.5. After counting is completed, select the "F7" key to save the results to a QC file (e.g. H:\PCASPEC\QC041503.spm).

5.1.6. Review and compare the results with previous results. If any of the parameters (Peak centroid, FWHA, and Efficiency) of the detector exceed control values, correct and repeat constancy check.

5.2. Sample analysis

5.2.1. Place the sample on the detector.

5.2.2. Write the sample information (sample number, CRA site information, sample weight, counting start date and time, and sample collection time) in the gamma spec sample logbook.

5.2.3. Select the "Ctrl" and "F2" keys to delete spectra before starting counts.

5.2.4. Select the "F3" key to set time for 3600 seconds.

5.2.5. Select the "F5" key to add sample information (sample number, CRA site information, and weight) to the spectra file.

5.2.6. Select the "F1" key to begin count.

5.2.7. After count is completed, select the "F7" key to save results in a spm file with a filename that is the sample number.

5.2.8. Repeat the procedure detailed above to run another sample.

6.0 DATA REDUCTION

6.1 Select GDR set up on a desktop screen, and change the nuclide library file (Appendix) for the specific analysis.

6.2 Select GDR Main. Open sample to be analyzed.

6.2.1 Select "F1 select"

6.2.2 Select "F2 file"

6.3 Enter analysis start date and time

6.4 Enter sample mass in grams

6.5 Enter sample ID from the logbook

6.6 Select "F1 read energy and resolution data from file"

6.7 Select "F1 efficiency data from file"

6.8 Select "F4 search"

6.9 Select "F3 print to file" to save as a text file.

6.10 Enter file name that is the sample number.

6.11 Select "F4 report"

6.12 Repeat above procedure starting at item 6.2.1 to analyze another sample or select the "ESC" key to exit the program and review the results.

7.0 APPENDIX

7.1 Example of GDR setup

Appendix

Driver File: GDRIVER.DAT

Sensitivity: 2.0
Search Start Channel 0
Search Stop Channel -1
Low Energy Cutoff (keV): 40

Detector File Number 1
Standards File Number: 3
Nuclide Library: H:\GDR\LIB\2Ra
Efficiency File: H:\gdr\eff\500mar
Bkg Subtract File: h:\gdr\bkg\night
Bkg Subtract: PEAK
Long Activity Report: OFF
MPC Report: OFF
1-Sigma Multiplier: 1.00

Strt Samp Date: 00-00-00 00:00
Stop Samp Date: 00-00-00 00:00
Sample Volume: 1.00
Volume Units : g

Activity Units : uCi
Mult. Factor to uCi: 1.0000e+000
Decay Correct : OFF
Library Window (keV) : 2.0
Fraction Limit (%) : 10.00
Decay Limit (#hlives) : 8.00
Gaussian Peak Fit : MULT. ONLY
Force Equal FWHM for Fits : OFF
Vol Mult. Factor to ml: 1.0000e+000

Ludlum 193 Procedures

1.0 PURPOSE

This procedure describes the procedures used for surveying with a Ludlum 193 meter configured with a model 44-10 2" by 2" NaI(Tl) gamma scintillation detector. This instrument is used to perform gamma radiation level surveys for characterization of radiation levels due to radionuclides in soil.

2.0 SCOPE

This procedure applies to preparation and use of a Ludlum Model 193 survey meter. All personnel who use the meter must read and understand sections 1-5 of the Ludlum 193 instruction manual.

3.0 REFERENCES

3.1 Ludlum 193 Instruction Manual

3.2 RSSI Instrument Calibration Manual

3.3 Calibration Trial Form (RSSI form used to document calibrations)

3.4 CRA's Removal Action Work Plan covering Excavation and Restoration Activities

4.0 EQUIPMENT AND MATERIALS

4.1 Ludlum 193 survey meter with a model 44-10 2" by 2" NaI(Tl) gamma scintillator

4.2 Ludlum detector shield

4.3 Daily Instrument Check Form (attached)

4.4 Ludlum Model 193 Calibration to Kerr-McGee Source Block form (attached)

4.5 Calibration standard provided by Kerr-McGee, West Chicago, Illinois

4.6 Check source

5.0 PROCEDURES

5.1 INITIAL CALIBRATION

Initial calibration to Kerr-McGee source blocks must be performed prior to use in an unshielded or shielded mode. Calibration to the Kerr-McGee source blocks will only be performed once by the Health Physics Supervisor or equivalent. All radiation levels will be recorded utilizing the slow response mode in kilocounts per minute (kcpm) on the Ludlum Model 193 Calibration to Kerr-McGee Source Block form.

5.1.1 UNSHIELDED DETECTOR

5.1.1.1 Record the check source identification and response at the top of the Daily Instrument Check Sheet from the Trial Form.

5.1.1.2 Perform the daily instrument checks listed in section 5.3.

5.1.1.3 The concentration of the Kerr-McGee source block is 10 pCi/gm.

5.1.1.4 Record the background radiation level (Bkg) on contact with the background blocks.

5.1.1.5 Record the 10 pCi/gm source block radiation level on contact with the source blocks (Source).

5.1.1.6 Calculate the net Average (Net = Source - Bkg).

5.1.1.7 Calculate the response in kcpm per pCi/gm in the Kerr-McGee 10 pCi/gm source block for 1 pCi/gm (1 pCi/gm level = Net ÷ 10).

5.1.1.8 Calculate the radiation level for 4.2 pCi/gm (4.2 pCi/gm level = 1 pCi/gm level x 4.2).

5.1.2 SHIELDED DETECTOR

5.1.2.1 Repeat steps 5.1.1.1 through 5.1.1.8 with a shielded detector.

5.2 ALARM SETPOINT

The alarm setpoint is only adjusted by or under the direction of the Health Physics Supervisor. All radiation levels are to be recorded in kcpm.

5.2.1 After performing the daily instrument check, record the background in the Maximum Background Level column at the top of the Daily Instrument Check Sheet. If this level is exceeded with future use of the instrument, the limit alarm setpoint is recalculated and a new Daily Instrument Check Sheet created.

5.2.2 Record the set value in kcpm on the Ludlum Model 193 Calibration to Kerr-McGee Source Block form.

5.2.3 Expose the instrument to a check source. Adjust the limit alarm "SET" potentiometer to alarm at the calculated level.

5.2.4 Remove the source and depress the "RESET" button to disable the alarm. Slowly increase the meter reading with the check source to confirm the limit alarm set point. Readjust as necessary.

5.3 DAILY INSTRUMENT CHECK AND SET-UP

Any deviations from what is expected must be brought to the Health Physics Supervisor's attention before the instrument may be used.

5.3.1 Visual Inspection

5.3.1.1 Inspect the instrument to ensure that there is no damage to the instrument or probe.

5.3.2 Battery Check

5.3.2.1 Ensure that the toggle switches are in the AUD "ON," and "F" positions. Rotate the Range selector switch to the "BAT" position. Ensure the pointer deflects above the vertical mark in the "BAT OK" region. The batteries are to be replaced at 20% above the low level indication.

5.3.3 Background Check and Background Alarm

5.3.3.1 After background is stable for at least 8 seconds, record the background level. Ensure the background level is below the maximum background level specified on the Daily Instrument Check Sheet. Move to a lower background area if necessary.

5.3.3.2 The background must be recorded each time the instrument is turned on or reset.

5.3.4 Source Check

5.3.4.1 Expose the detector to the check source as specified on the instrument. Ensure the intermittent background audio and visual alarm is initiated followed by the constant alarm.

5.3.4.2 Record the check source response on the Daily Instrument Check Sheet.

5.3.4.3 If the instrument differs more than 20% from the stated expected response, contact the health physics supervisor.

5.3.5 Documentation

All fields in the Daily Instrument Check Sheet table must be filled out before the instrument is used each day. Only the time and background level fields need to be completed during that same day when the instrument is reset or subsequently turned off and back on.

5.4 INVESTIGATING ALARMS

Occasionally, fluctuations in background will cause the rate of change alarm to beep. This is a normal function of the instrument. Multiple beeps indicate an increase in the radiation level. This has been set at the count rate equivalent to 4.2 pCi/gm. If the instrument responds with a steady beep, stop the operations and notify the Health Physics Supervisor and CRA. This practice may be modified in the field with the Health Physics Supervisor's, CRA's and USEPA approval.

RSSI

6312 West Oakton Street
Morton Grove, IL 60053-2723
847-965-1999
Fax 847-965-1991

Daily Instrument Check Sheet

Instrument: Make: Ludlum Model: 193 Serial Number ________ Probe Ludlum 44-10
Cal Date___/___/___
Maximum Background Level________ Instrument Used By
____
Check Source Identification________________________ Expected Response
____

Date	Time	Initials if different from above	Toggle Switches Up, Scale on 10x	Battery OK	Background Level	Check Source Response

Comments
____
____
____

RSSI

6312 West Oakton Street
Morton Grove, IL 60053-2723
847-965-1999
Fax 847-965-1991

Ludlum Model 193 Calibration to Kerr-McGee Source Block

193 Serial Number						
Date						
Initials						
Background (kcpm)						
Source (kcpm)						
Net (kcpm)						
1.0 pCi/gm (kcpm)						
4.2 pCi/gm (kcpm)						
Gross (cpm)						
Set (kcpm)						
Alarm (kcpm)						

Comments

____

____

____

APPENDIX G

HEALTH AND SAFETY PLAN

TABLE OF CONTENTS

TABLE OF CONTENTS

Page

TABLE OF CONTENTS

Page

LIST OF FIGURES
(Following Text)

LIST OF FORMS
(Following Text)

LIST OF TABLES
(Following Text)

LIST OF APPENDICES

EMERGENCY PLAN

The Site Health and Safety Coordinator (HSC) will coordinate the emergency response at the Site. In the event of any emergency, the HSC is to be notified and will be responsible for notifying the proper response agencies listed in Table 1.0, Emergency Phone Numbers. Emergency response procedures, instruction for emergency response to injuries, and evacuation plans will be reviewed at safety briefings.

Table 1.0 will be posted by the HSC in appropriate areas. The emergency numbers will be reviewed every three months by the HSC and revised as necessary. The HSC will sign and date new revisions. Upon revision, the table will be submitted to the United States Environmental Protection Agency (USEPA), and the City of Chicago.

Emergency services are to be provided via the 911 Emergency Medical system. Non-emergency services will be provided by Northwestern Memorial Hospital. Directions to this location are found on Figure 2.3.

The HSC will implement the emergency action plan when conditions at the Site warrant such action. The HSC will be responsible for coordinating the evacuation, emergency treatment, and emergency transport of site personnel, as necessary, and inform the appropriate coordinating management staff. The following are examples of conditions that may require implementation of the emergency action plan.

- Fire or explosion on site.
- Serious personnel injury.
- Release of radioactivity exceeding limits as described later in this HASP.
- Release of hazardous materials, including gases or vapors at elevated levels.
- Unsafe working conditions, such as inclement weather (tornado, hail, etc.).

In the event excavation within the potentially impacted area is required on an emergency basis, the following shall be incorporated to the extent possible, and all personnel working in the potentially impacted areas shall be given the opportunity to read this section of the Health and Safety Plan (HASP). The remainder of the attached HASP will be implemented as conditions allow.

PROTECT WORKERS POTENTIALLY EXPOSED TO IMPACTED SOIL

1) Notify workers that levels of radiation above background levels may be present in excavated soil.

2) Avoid ingesting soil. Avoid inhaling dust from contaminated areas. Minimize contact with the soil to the extent possible. Wear protective coveralls or disposable coveralls to facilitate decontamination of workers.
3) Screen excavation for gamma radiation.

AVOID SPREAD OF CONTAMINATION

1) Limit erosion transport of excavated soil through use of hay bales, sandbags, or temporary berm materials to minimize uncontrolled runoff.
2) Cover any excavated soil piles until screened for potential contamination.
3) Screen soil prior to transport away from project site.
4) Do not remove equipment which has been in contact with potential contamination until it has been checked and released.

MINIMIZE POTENTIAL PUBLIC CONTACT

1) Limit access to excavated soil using barricades, temporary fencing, or jersey barriers.
2) Cover excavated piles to minimize fugitive dust. Wet dusty excavations.
3) Control, to the extent possible, off-site tracking by vehicles, and potentially contaminated boots or clothing worn by workers.

MONITOR CONTAMINATION

To the extent practicable, provide gamma radiation screening of the exposed soils in the excavation.

1) When possible, provide high volume air samplers immediately adjacent to potential or known exposed contaminated soil, to monitor for fugitive emissions.
2) Survey ground surface/pavement surface around potential or known contamination locations for elevated gamma radiation.

DISPOSAL

1) Any excavated material should be disposed of as required by law.

NOTIFY AUTHORITIES

1) Notify agencies identified on the enclosed emergency notification list.

   USEPA 312-353-2318 (US Environmental Protection Agency)
   CDE 312-744-7672 (Chicago Department of the Environment)
   IEMA 217-782-7860 (Illinois Emergency Management Agency, Division of Nuclear Safety)

   Notification should include, as a minimum, the following:

   - Location of Excavation
   - Potential Contact with Thorium Containing Soil
   - Field surveys measuring maximum reading
   - Samples measuring maximum reading

The following support services should be secured:

- Gamma radiation survey equipment should be secured promptly for site screening.
- Personnel and monitoring equipment should be secured promptly to provide survey and monitoring services in accordance with the attached plan, and to survey equipment for release as uncontaminated.

1.0 SCOPE OF PLAN

The following Health and Safety Plan (HASP) will be utilized and modified as necessary in order to minimize and prevent exposures to hazardous substances and conditions related to all excavation and restoration activities at 247 East Ohio Street, Chicago, Illinois. All CRA personnel assigned to this project will be required to review thoroughly the contents of the HASP and to adhere strictly to the policies and procedures listed herein. This HASP is for use only by Conestoga-Rovers & Associates personnel. Contractors and subcontractors shall develop activity specific HASPs which are specific to their Scope of Work (SOW) and are in accordance with the generic HASP which is located on the USEPA Region 5 website at the following web address: www.epa.gov/Region5/sites/lindsaylight/pdf/lindsaylight_healthplan.PDF.

This plan meets the requirements of OSHA 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, and applicable subparts of OSHA 29 CFR 1926, 1910. Visitors will be required to review the Health and Safety Plan and read and sign the visitor information sheet (Form 1.1).

Additional details including a project overview, brief Site history and project organization is found in Appendix A.

1.1 BASIS FOR DESIGN

Regulations set forth by OSHA in Title 29, CFR, Parts 1910 and 1926 (29 CFR 1910 and 1926) form the basis of this section of the HASP. Emphasis is placed on Section 1926.65 (Hazardous Waste Operations and Emergency Response), 1910 Subpart I (Personal Protective Equipment), 1910 Subpart Z (Toxic and Hazardous Substances), 1926 Subpart O (Motor Vehicles, Mechanized Equipment, and Marine Operations), and 1926 Subpart F (Excavations). Some of the specifications within this section are in addition to the OSHA regulations, and reflect the positions of the United States Environmental Protection Agency (USEPA), and the National Institute for Occupational Safety and Health (NIOSH) regarding safe operating procedures at hazardous waste sites. Regulations regarding radioactive materials are discussed earlier in this HASP.

The health and safety of the public and Site personnel and the protection of the environment will take precedence over cost and scheduling considerations.

2.0 SAFETY MANAGEMENT

The following safety management structure will be utilized for the implementation, administration, and monitoring of the HASP.

2.1 HEALTH AND SAFETY COORDINATOR

The Health and Safety Coordinator (HSC) shall assume overall responsibility for the HASP. The HSC or designee shall monitor and maintain quality assurance of the HASP until project completion. Principal duties of the HSC include:

- Review project background data;
- Approve all HASP modifications;
- Administer and enforce the HASP;
- Evaluate the adequacy of personal protective equipment (PPE) to be used by Site personnel;
- Conduct required on-site training;
- Brief visitors on work-site conditions; and
- Administer personnel and ambient air monitoring procedures.

The HSC or designee has the authority to stop work in the event conditions develop which pose an unreasonable risk to Site personnel or persons in the vicinity.

3.0 PERSONNEL RESPONSIBILITIES

The HSC or designee will administer and supervise the HASP at the work-site level. The HSC will monitor all operations, be the primary on-site contact for health and safety issues, and have full authority to stop operations if conditions are judged to be hazardous to on-site personnel or the public.

The HSC will brief all Site personnel on the contents of the HASP. Personnel will be required to review the HASP, and have the opportunity to ask questions about the planned work or hazards. The HSC will conduct safety meetings to familiarize the Site personnel with Site conditions, boundaries, and physical hazards. Site personnel will conduct their assigned tasks in accordance with the HASP at all times.

All individuals on the Site will observe all Site health and safety rules, and will not commit any unsafe conditions, use faulty equipment or willfully cause conditions that could jeopardize health and safety of Site personnel.

If at any time Site personnel observe unsafe conditions, faulty equipment or other conditions which could jeopardize personnel health and safety, they are required to immediately report their observations to the HSC.

Work zones will be established at the Site. These zones include clean/support zones, decontamination zones, and exclusion zones. Known impacted areas where exclusion zones are to be established during the removal effort are shown on Figure 3.1. Although the clean/support zones are anticipated to remain fixed, other zones will be identified as excavation work progresses.

If unanticipated conditions arise, work at the Site will cease until the specific hazards can be identified. Site control requirements are outlined in Appendix B.

4.0 HAZARD ASSESSMENT

The following represents potential hazards associated with this project.

4.1 PRINCIPAL CONTAMINANTS (KNOWN OR SUSPECTED)

Thorium series, Uranium series including isotopes of Radium, Radon and their daughters. The contaminants are present in the soil at low concentrations. These primary routes of entry to the body will be considered:

Route	*Entry Made Via*
Inhalation	Airborne dust containing radioactive materials.
Ingestion	Airborne dust containing radioactive materials. Improper personal hygiene practices.
Eye and Skin	Direct contact with contaminants. Improper or poor personal hygiene practices. Airborne dust containing radioactive materials. Cuts and abrasions.
External	Penetrating radiation.

Should unanticipated hazards be discovered at the Site, such that they change the initial SOW, work at the Site will cease until specific hazards can be identified. Additional hazards will be identified and the work area will be controlled in accordance with the procedures outlined in Appendix B.

4.2 PHYSICAL HAZARDS

Before field activities begin, the HSC will conduct a Site reconnaissance to identify any existing or potential hazards created from Site activities. Physical hazards inherent to construction activities and power-operated equipment may exist. Excavation activities will follow the procedure outlined in Appendix J.

4.2.1 HEAT STRESS

There are a variety of measures that can be implemented to prevent or reduce the likelihood of employees developing heat stress related disorders. These include fluid and electrolyte replenishment, the provision of shelter from the sun and heat, work schedule adjustment, the use of cooling devices, acclimatization, heat stress monitoring, and employee education, as discussed below:

- Fluid and Electrolyte Replenishment: Personnel should drink about 16 ounces of water before starting work and drink water at every break. To encourage water consumption, cool water and disposable cups should be made available. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, personnel should be encouraged to drink more. Replacing body fluids with Gatorade is an option. It is advisable to have Gatorade on site if the air temperature is 70°F (21°C) or more and the workers are performing tasks with a moderate to heavy work load in chemical resistant clothing.
- Shelter From the Sun and Heat: Air-conditioned (if possible) or shaded areas should be made available for rest periods. Sitting in an air-conditioned truck is an acceptable option.
- Work Schedule Adjustment: Scheduling work for early mornings and/or late afternoons will avoid the hottest parts of the day and reduce the heat stress placed on personnel. Rotation of personnel will help reduce overexertion of workers and adjusting the work-rest schedule will help personnel recover from the effects of heat stress periodically.
- Use of Cooling Devices: The use of cooling devices like field showers, hose-down areas, or cooling vests should be considered for project tasks that involve heavy work loads in chemical resistant clothing.
- Acclimatization: Acclimatization is the gradual introduction of workers into a hot environment to allow their body to physiologically adjust to hot working conditions. Acclimatized individuals generally have lower heart rates and lower body temperatures. In addition, they sweat sooner and more profusely and even have more dilute sweat (thereby losing less electrolytes) than non-acclimatized individuals.
- Heat Stress Monitoring: Monitoring hot environments for potential heat stress should be initiated when the ambient air temperature is in excess of 70°F. There are several ways to monitor heat stress: measuring heart rate, oral temperature, loss of body weight, and the Wet Bulb Globe Temperature using a Reuter-Stokes or Quest

Electronics heat stress monitor. CRA employees are advised to measure their heart rates as a primary means of heat stress monitoring.

- Employee Education: Workers have already been trained to recognize and treat the effects of heat stress during the 40-hour training course. Signs, symptoms, and treatment of heat stress should be discussed in site safety meetings. The buddy system will help in preventing heat stress once the employees are trained to recognize the signs and symptoms of heat stress.

4.2.2 COLD STRESS

If the field activities occur during a period when temperatures average below freezing, the following guidelines will be followed.

Persons working outdoors in temperatures of 50°F and below may suffer from cold exposure if there is air movement. During prolonged outdoor periods with inadequate clothing, effects of cold exposure may even occur at temperatures well above freezing. Cold exposure may cause severe injury by freezing exposed body surfaces (frostbite) or result in profound generalized cooling, possibly causing death. Areas of the body which have high surface area-to-volume ratios such as fingers, toes and ears are the most susceptible to frostbite.

Two factors influence the development of a cold injury: ambient temperature and wind velocity. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph.

Additionally, water conducts heat 240 times faster than air. Thus, due to the combined effects of conduction, convection, and evaporation, the body cools suddenly when external chemical protective equipment is removed if the clothing underneath is perspiration-soaked.

Local injury resulting from cold is included in the generic term "frostbite." There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost nip or incipient frostbite: Characterized by sudden blanching or whitening of skin.

- Superficial frostbite: Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep frostbite: Tissues are cold, pale, and solid; extremely serious injury.

Prevention of frostbite is vital. Keep the extremities warm. Wear insulated clothing as part of one's protective gear during extremely cold conditions. Check for symptoms of frostbite at every break. The onset is painless and gradual - you might not know you have been injured until it is too late.

To administer first aid for frostbite, bring the victim indoors and rewarm the areas quickly in water 95° to 100°F. Give individual a warm drink - not coffee, tea, or alcohol. The victim should not smoke. Keep the frozen parts in warm water or covered with warm clothes for 30 minutes, even though the tissue will be very painful as it thaws; then elevate the injured area and protect it from injury. Do not allow blisters to be broken. Use sterile, soft, dry material to cover the injured areas. Keep victim warm and get immediate medical care.

Dehydration, or the loss of body fluids in the cold environment can occur without workers noticing and may increase the susceptibility of workers to cold injury due to significant change in blood flow to the extremities. Warm, sweetened drinks and soups should be provided at the Site to provide caloric intake and fluid volume. Caffeine should be limited because of the diuretic and circulatory effects.

4.2.3 ELECTRICAL HAZARDS

Overhead power lines, downed electrical wires, buried cables, and improper use of electrical extension cords can pose a danger of shock or electrocution. All Site personnel should immediately report to the HSC or supervisor any condition that could result in a potential electrical hazard.

The HSC or supervisor will notify Site personnel during the safety meetings of the locations of known underground cables and utilities.

4.2.4 NOISE HAZARD

Operation of equipment may present a noise hazard to workers. Site personnel will utilize hearing protection when noise levels are determined to be in excess of 29 CFR 1910.95 requirements. Noise monitoring will be performed to determine noise levels.

4.2.5 OVERT CHEMICAL EXPOSURE

Typical response procedures include:

SKIN CONTACT: Use copious amounts of soap and water. Wash/rinse affected area thoroughly, then provide appropriate medical attention. Eye wash will be provided on site at the work zone and support zone as appropriate. If affected, eyes should be continuously flushed for a minimum of 15 minutes.

INHALATION: Move to fresh air and transport to hospital. Decontaminate as other actions permit.

INGESTION: Transport to emergency medical facility. Decontaminate as permitted by other requirements.

PUNCTURE WOUND OR LACERATIONS: Transport to emergency medical facility. HSC will provide Material Safety Data Sheets (MSDS) to medical personnel as applicable. Decontaminate as permitted by other requirements.

4.2.6 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the HSC will determine if work can continue without endangering the health and safety of field workers. Some items to be considered before determining if work should continue are:

- Potential for heat stress and heat-related injuries
- Potential for cold stress and cold-related injuries
- Treacherous weather-related working conditions
- Limited visibility
- Potential for electrical storms or high winds

4.3 MEDICAL EVALUATION AND SURVEILLANCE PROGRAM

All field project personnel will have received a medical evaluation in accordance with 29 CFR 1910.120 prior to commencing work at the Site. Medical records for all on-Site personnel will be maintained by their respective employers. Personnel may be required to provide the HSC written confirmation that their medical records are up-to-date prior to working at the Site.

4.3.1 DOSIMETRY/PERSONNEL MONITORING

All project personnel shall participate in a dosimetry program administered by the RSSI, a health physics consulting firm located in Morton Grove, Illinois. [The dosimetry program shall comply with OSHA 29 CFR 1910.1096 and 32 IAC 340.510(d). (i.e. dosimeters shall be processed by a dosimetry processor accredited by the National Voluntary Laboratory Accreditation Program.)] RSSI's personnel shall maintain records of all radiation exposures incurred by field personnel. These records will be maintained in an up-to-date manner to comply with the requirements of 32 IAC 340.4010. The HSC shall review the results of personal exposure monitoring to determine compliance with exposure limit requirements.

4.3.2 REQUIREMENT FOR DOSIMETRY

Personal dosimetry is required for anyone who enters a radiologically controlled area in which he/she may receive in one calendar year a dose in excess of 10% of the limits in 32 IAC 340. Any person who works in a radiation area will be required to have a personal dosimeter. As a matter of policy, all individuals shall be required to use a dosimeter [either self-reading type, film badge, Thermoluminescence Detector (TLD), or optically simulated luminescence (OSL)] whenever they enter the exclusion zone.

4.3.3 BIOASSAY

Bioassay is the determination of the types and amounts of radioactive materials, which are inside the body. By analyzing the rate of deposition, the rate of excretion, and any other available information regarding placement in the body, internal exposures from radioactive materials can be estimated.

Bioassays are not anticipated to be required for the excavation and removal activities proposed, based on levels documented as present. The determination of the need for bioassay will be based on recommendations made by RSSI's personnel.

4.3.4 EMERGENCY MEDICAL TREATMENT

Emergency first aid should be administered on site as appropriate. Treatment of injury is of primary concern and decontamination secondary. The HSC or designee will complete the appropriate incident report, if warranted. Refer to Section 4.4 of the HASP, Accident and Incident Reporting.

An emergency first-aid station will be established and will include a first-aid kit for on-site emergency first aid.

Provisions for emergency medical treatment shall be integrated with the following guidelines:

- At least one individual qualified to render first aid and Cardiopulmonary Resuscitation (CPR) will be assigned to each shift.
- Emergency first aid stations will be established in the immediate work vicinity.
- Phone numbers and procedures for contacting ambulance services, fire department, police, and medical facilities will be conspicuously posted.
- Maps and directions to medical facilities will be posted.
- Evacuation routes and gathering area locations shall be posted around the Site.

4.4 ACCIDENT AND INCIDENT REPORTING

All accidents, injuries, or incidents will be reported to the HSC. This accident/incident will be reported as soon as possible to the employee's supervisor. An accident/incident form will be completed by the HSC. A copy of the form is included as Form 4.1.

5.0 TRAINING

All Site personnel shall be trained and certified in accordance with 29 CFR 1910.120.

5.1 PROJECT AND SITE-SPECIFIC TRAINING

Prior to project start-up, all assigned personnel shall receive an initial project-specific and Site-specific training session. This training shall include, but not be limited to, the following areas:

- Basic 40-hour course;
- Review of the Health and Safety Plan;
- Review of applicable radiological and physical hazards;
- PPE levels to be used by Site personnel;
- Site security control;
- Emergency response and evacuation procedures;
- Project communication;
- Required decontamination procedures;
- Prohibited on site activities;
- Instructions to workers in accordance with 32 IAC 400.120 and 29 CFR 1910.1091;
- U.S. NRC Regulatory Guide 8.13 and Declared Pregnant Worker Policies (Females); and
- Meet the requirements for hazardous waste operations.

During training, project personnel will be provided a copy of the Site Safety Plan. A template copy is provided in Form 5.3.

5.2 VISITOR ORIENTATION

All non-essential personnel and visitors who plan to enter the exclusion zone will be briefed on the HASP requirements and 32 IAC 400.120 Subpart D requirements prior to entry with a trained Site escort. In addition, female visitors will be instructed regarding U.S. NRC Regulatory Guide 8.13 and Declared Pregnant Worker Policies.

5.3 SAFETY TAILGATE MEETINGS

Before the start of the work week, on Monday mornings, a brief safety meeting will be conducted for all Site personnel. The purpose of these meetings will be to discuss project status, problem areas, conditions, safety concerns, PPE levels and to reiterate HASP requirements. The HSC will complete a Safety Meeting Report (Form 5.1) to indicate the contents of the meeting and the attendees.

5.4 FIRST AID

At least one (1) individual, trained and qualified to administer first aid and CPR in accordance with American Red Cross or American Heart Association requirements, will be present at the Site.

5.5 SAFE WORK PERMIT

Site workers in special work conditions such as confined space, hot work, trenching, or other physical hazards, must be skilled at such work and trained to recognize these as special work conditions. If the above conditions become necessary, they will be accomplished under a Safe Work Permit program. Confined space is defined by OSHA 1910.146. Section 13.0 of this HASP contains further information on the Confined Space Program. A Confined Space Entry Permit is included as Form 13.1.

6.0 COMMUNICATIONS

6.1 GENERAL COMMUNICATIONS

The Site will have available the means for telephone or equivalent communications, for summoning emergency assistance from the fire/ambulance and police departments in the event they are required. The telephone will also act as a direct link to technical personnel for information pertaining to all phases of the project.

6.2 RADIO/TELEPHONES

Short-range walkie-talkies or cellular telephones may be made available to designated personnel working at the Site.

6.3 EMERGENCY WARNING

In the event of an emergency condition, the HSC will notify project personnel verbally, if all are within immediate hearing, and via a bullhorn if required. The HSC will also notify visitors present within the area. Site personnel will immediately proceed to a pre-designated assembly area during the daily safety meeting. Personnel will remain in the designated area until further instructions are received by the HSC.

All communication equipment will be tested at the beginning of each day to verify operational integrity.

6.4 HAND SIGNALS

Hand signals will be used by field personnel in conjunction with the buddy system. Hand signals shall be familiar to all field personnel before operations commence and should be reviewed during Site-specific training.

Signal	*Meaning*
Hand gripping throat	Out of air; can't breathe
Grip partner's wrist	Leave area immediately; no debate
Hands on top of head	Need assistance
Thumbs up OK	I'm all right; I understand

Thumbs down	No; negative

6.5 SITE SECURITY

Only authorized personnel will be permitted on the Site in accordance with the requirements of this HASP. Visitors and other non-essential personnel may enter the work area in accordance with the controls set forth in Appendix B.

7.0 PERSONNEL EXPOSURE AND AIR QUALITY MONITORING

7.1 AIR QUALITY (DUST)

Due to the nature of the principal contaminants associated with the project, dust suppression will be important as a means of minimizing exposure levels and off-site migration of contaminants. The HSC will routinely monitor the project area. The OSHA personal exposure limit (PEL) for nuisance dust is 15 mg/m^3 (total), 5 mg/m^3 (resp.).

7.2 AIRBORNE RADIOACTIVITY MONITORING

Monitoring for airborne radioactivity exposure requires the following elements:

- Air sampling for radioactive particulates,
- Recordkeeping regarding personnel work locations and time in location, and
- Respiratory protective equipment records regarding devices used by workers in airborne radioactivity areas.

By closely monitoring these three elements, a continuous record of personnel exposure to airborne radioactivity is maintained. RSSI has been selected to conduct occupational exposure sampling of personnel and environmental monitoring of the work areas for airborne radioactivity. A copy of RSSI's Radiological Health and Safety Plan (RHASP) is included as Appendix M.

Personal air samplers may be utilized for airborne radioactivity monitoring. Air filters shall be analyzed on a daily basis to determine potential contributions to dose from radionuclides. It is expected that naturally occurring radon and thorium daughters will interfere with analyses. Additional evaluation of samples shall be performed when determined necessary based upon elevated results. Such analyses shall be performed after allowing time for decay of short-lived radionuclides. Results shall be compared with the limits in Table I, Column 1 of Appendix B to 10 CFR 20 effective July, 1970.

Perimeter monitoring of the excavation areas for radioactive particulate activity also will be performed. Environmental monitoring results shall be compared with the limits in Table 2, Column 1 of Appendix B to 10 CFR 20 effective January 1, 1994. High volume air samplers shall run continuously during operations and be evaluated on a daily basis for gross alpha activity. Comparisons will be made to 32 IAC 340 Appendix A to ensure that adequate radiological controls are in place for workers and the general public. As low as reasonably achievable (ALARA) concepts will be utilized when considering protective measures to ensure that internal exposures are minimized, while also considering the effects of such protective measures with respect to external exposures. Controls on the Site, such as wetting of soils and procedural changes, will be employed prior to the prescription of respiratory protective equipment.

7.3 INTERNAL MONITORING

Internal monitoring to determine intakes of radioactive material will be performed as needed, based upon the results of the air sampling program. Bioassay methods to be considered should include in-vivo, as well as invitro, assessments. Routine bioassay of workers is not anticipated based upon the low concentrations of radioactivity in soils to be excavated.

7.4 EXTERNAL RADIATION MONITORING

External radiation monitoring of workers will be performed using film, TLD or OSL. Dosimetry will be provided and processed by a service holding National Voluntary Laboratory Accreditation Program (NVLAP) certification. Pocket dosimeters may also be utilized for visitors and other infrequent personnel requiring access to the Site.

7.5 RADIOLOGICAL SURVEYS

Radiological surveys will be performed to ensure that radiation levels and contamination levels are under regulatory limits for workers and the general public.

7.6 CONTAMINATION MONITORING

Surveys shall be conducted in work areas to ensure that radioactivity is below acceptable levels. Decontamination of elevated areas will be performed to maintain radioactivity at levels that are as low as reasonably achievable (ALARA).

Before leaving the exclusion zone, Site personnel shall be checked to ensure that contamination is not present on skin or clothes. The HSC will be immediately informed regarding any contamination on individuals and will initiate appropriate decontamination techniques. Proper disposition of contaminated personal effects and clothing also will be overseen by the HSC.

7.7 ACTION LEVELS

7.7.1 RADIOLOGICAL ACTION LEVELS

Radiological action levels for on-site workers will be determined by airborne particulate monitoring for the presence of radioactivity. RSSI will perform radiological monitoring. The radioactive contamination on the Site is particulate and insoluble in water. Therefore, there will be no fixed contamination on the workers. Action levels as determined by radioactive monitoring can be found in Table 7.1.

To avoid the need for upgrade of personal protection equipment due to airborne contamination, engineering controls such as the use of water to minimize dust levels will be implemented as necessary during excavation and restoration activities.

8.0 PERSONAL PROTECTIVE EQUIPMENT

It is anticipated that most excavation activities in designated exclusion zones can be conducted in Level D personal protective equipment (PPE), with a contingency upgrade to Level C. Level C will be used when required by special work permits, or when directed by the HSC.

Level D personal protective clothing and equipment for excavation activities includes:

- Coveralls
- Hard hat
- Chemical resistant, OSHA approved safety shoes/boots
- Cotton or leather gloves
- Safety glasses

Level C protective clothing and equipment includes:

- Full-face air-purifying respirator (NIOSH approved) fitted with radionuclides/HEPA cartridges (P100) and/or organic vapor cartridges, depending on which action levels are exceeded
- Coveralls
- Tyvek coveralls - required in areas when splashing by contaminated soils or water is a possibility
- Cotton or leather gloves
- Disposable latex inner gloves - required in areas when splashing by contaminated soils or water is a possibility
- Nitrile outer gloves (taped) - required in areas when splashing by contaminated soils or water is a possibility
- Chemical-resistant steel toe boots
- Hard hat

Action levels used to determine the need to upgrade or downgrade the levels of protection are described in Section 7.0 of this HASP.

9.0 CONTAMINATION REDUCTION PROCEDURES

9.1 EQUIPMENT

Portable equipment will be decontaminated with soap and water and rinsed with tap water. Heavy equipment will be cleaned with water and, if necessary, a detergent solution. It is not anticipated that chemical cleaning will be necessary for decontamination. Additional decontamination procedures can be found in Appendix I.

9.2 PERSONNEL

If levels of radioactivity show that individuals can remove coveralls and other personal protective clothing and equipment before leaving the work-site and, thus complete decontamination, the individuals may leave the Site. If, however, levels of radioactivity show that individuals cannot achieve decontamination by the removal of coveralls and showering is required, they will be dressed in clean coveralls, boots and gloves and be transported to Northwestern Memorial Hospital to complete decontamination.

If substantial skin contamination occurs on an individual working with radioactive materials, the following specific procedures should be followed to prevent fixation of the material in the skin or absorption of the radioactivity through the skin.

Immediate Action: Notify the HSC or designee, who will supervise the decontamination. If contamination is spotty, the HSC or designee will supervise the cleaning of the individual spots with soap and/or water. If the contamination is general, the HSC or designee may recommend washing the area gently in warm or cool water (not hot) using hand soap (not detergent) for one minute. Rinse, dry, and monitor for radioactivity. This soap wash step may be repeated three times.

Evaluation: If the above procedure fails to remove all the skin contamination, the treatment should cease. An evaluation of the skin contamination should be performed by the HSC or designee including an estimate of the dose commitment to the skin, and the quantity and identity of the nuclides contaminating the skin. If additional decontamination steps are necessary, they are performed and documented by the HSC. The guidelines for personnel decontamination in the Radiological Health Handbook, HEW 1970, beginning on page 194, can be used as applicable. These guidelines are supplied in Appendix E. CAUTION: Do not use chemicals for personnel decontamination until full evaluation of the contamination is made by the HSC or designee.

9.3 CONTAMINATION PREVENTION

Work practices that minimize the spread of contamination will reduce worker exposure and help ensure valid sample results by precluding cross-contamination. Procedures for contamination avoidance include:

- knowing the limitations of all personal protective equipment being used;
- avoiding walking through areas of obvious or known contamination;
- refraining from handling or touching contaminated materials directly (do not sit or lean on potentially contaminated surfaces);
- ensuring personal protective equipment has no cuts or tears prior to donning;
- fastening all closures on suits, covering with tape if necessary;
- taking steps to protect against any skin injuries;
- staying upwind of airborne contaminants; and
- refraining from eating, chewing gum, smoking, or engaging in any activity from which contaminated materials may be ingested while in contaminated areas.

9.4 DISPOSAL PROCEDURES

All discarded materials, waste materials, or other field equipment and supplies will be handled in such a way as to preclude the spread of contamination, creating a sanitary hazard, or causing litter to be left on site. All potentially contaminated waste materials (e.g., clothing, gloves) shall be monitored and segregated in accordance with monitoring results into either radioactive or non-radioactive waste. Appropriate labels shall be affixed to all containers of radioactive materials.

10.0 GENERAL WORK PRECAUTIONS

10.1 GENERAL WORK PRECAUTIONS

The following general work precautions apply to all Site personnel:

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in the work area.
- Hands and face must be thoroughly washed upon leaving the work area. Wash water will be provided at the Site for this purpose.
- Whenever levels of radioactivity warrant, the entire body should be thoroughly washed, as soon as possible, after the protective coveralls and other clothing are removed as part of the decontamination process.
- No facial hair that interferes with a satisfactory fit of the mask-to-face-seal is allowed on personnel required to wear respirators.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate, discolored surfaces; kneel on ground; lean, sit, or place equipment on drums, containers, or the ground.
- Medicine, drugs and alcohol may interfere with or impair judgment and reaction times. Therefore, usage of prescription and non-prescription drugs must be specifically approved by a qualified physician and made known to the HSC prior to an individuals' presence on the work-site. Alcoholic beverage intake is strictly prohibited at the Site and prior to work.
- All personnel must be familiar with standard operating procedures and any additional instructions and information contained in the HASP.
- All personnel must adhere to the requirements of the HASP.
- Contact lenses may be worn with a full-face respirator provided person doing so informs his supervisor or the Site HSC; they are not otherwise permitted when respiratory protection is required or where the possibility of a splash exists.
- Personnel must be cognizant of symptoms for radiological exposure on site, for heat stress and cold stress, and knowledgeable regarding emergency measures contained in the Emergency Plan.
- Respirators shall be cleaned and disinfected after each day's use or more often, if necessary.

- Prior to donning, respirators shall be inspected for worn or deteriorated parts. Emergency respirators or self-contained devices will be inspected at least once a month and after each use.
- Each employee shall be familiar with the project's Respiratory Protection Program (Appendix L).

10.2 OPERATIONAL PRECAUTIONS

The following operational precautions must be observed at all times.

- All Site personnel shall be adequately trained and thoroughly briefed on anticipated hazards, equipment to be worn, safety practices to be followed, emergency procedures, and communications.
- All required respiratory protective devices and clothing shall be worn by all personnel going into areas designated for wearing protective equipment.
- All Site personnel shall use the buddy system when wearing respiratory protective equipment. At a minimum, a third person, suitably equipped as a safety backup, is required during extremely hazardous entries.
- During continual operations, on-site workers act as a safety backup to each other. Off-site personnel provide emergency assistance.
- Personnel should practice any unfamiliar operations prior to undertaking the actual procedure.
- Entrance and exit locations shall be designated and emergency escape routes delineated. Warning signals for Site evacuation must be established.
- Personnel and equipment in the contaminated work area should be minimized, consistent with effective Site operations.
- Work areas for various operational activities shall be established.
- Procedures for leaving a contaminated area shall be planned and implemented prior to going on site. Work areas and decontamination procedures shall be established based on expected Site conditions.
- Frequent and regular inspection of Site operations will be conducted to ensure compliance with the HASP. If any changes in operation occur, the HASP will be modified to reflect those changes.

11.0 SANITARY FACILITIES

11.1 POTABLE WATER

a) An adequate supply of potable drinking water shall be maintained at all times immediately outside the Site. Drinking water shall meet all federal, state and local health requirements.

b) Drinking water shall be supplied to project personnel via approved dispensing sources.

c) Paper cups shall be permitted for the drinking of potable water supplies.

d) Drinking water dispensers shall be clearly marked and shall, in no way, have the potential for contamination from non-potable supplies.

e) Site personnel must be fully decontaminated prior to approaching the drinking water supply.

11.2 TOILET FACILITIES

a) Adequate toilet facilities shall be provided at the Site.

b) These facilities shall be in the form of portable chemical toilets.

c) Routine servicing and cleaning of the toilets should be established with the selected contractor and shall be in accordance with federal, state, and local health regulations.

d) Site, personnel must be fully decontaminated prior to approaching the toilet facilities.

11.3 WASHING AREAS

a) Adequate washing areas shall be provided for personnel use within the work area.

b) Washing areas shall be maintained in a sanitary condition and will be provided with adequate supplies of soap, towels for drying, and covered waste receptacles.

c) Washing areas shall be maintained and sanitized daily.

d) No eating, drinking or smoking shall be permitted in the work area. This policy will be strictly enforced by the HSC.

12.0 FIRE CONTROL EQUIPMENT

An adequate number of approved portable fire extinguishers (class rated A, B and C) shall be readily available at the Site at all times.

All Site personnel shall be trained in the use of the extinguishers. Extinguishers shall only be used on outbreak stage fires or fires of minor nature. The local fire department shall be contacted in the event of a larger fire.

13.0 CONFINED SPACE PROGRAM

13.1 PURPOSE

In the event that confined space work is a necessity, a Confined Space Program will be implemented. Training in the recognition of confined spaces is a component of the health and safety training program.

The purpose of the Confined Space Program is to establish procedures to protect personnel from this serious hazard in the course of their work; and at a minimum, to comply with 29 CFR OSHA 1910.146. This document assigns responsibilities and sets standards for personnel engaged in activities where confined spaces may be present.

13.2 RESPONSIBILITIES

13.2.1 HEALTH AND SAFETY COORDINATOR

The Health and Safety Coordinator administers the Confined Space Program. The Health and Safety Coordinator's responsibilities include:

- Review of the HASP for potential confined space hazards and design alternative approaches to accomplish the confined space tasks;
- Coordinating and managing the Confined Space Program in the event one is required;
- Establishing priorities for implementation of the program;
- Assisting with recognition and implementation of the Confined Space Program;
- Advising project management on confined space issues; and
- Communicating the Confined Space Program to personnel by training related to specific Site activities.

13.2.2 SITE MANAGER

The Site Manager directs the application of the Confined Space Program to project work. The Site Manager is responsible for:

- Working with the HSC to prepare information describing activities that might be conducted in a confined space area;

- Assuring that all personnel engaged in project activities are familiar with the definition of a confined space; and
- Assuring that personnel are familiar with the Confined Space Program, and that project activities are conducted in compliance with the Confined Space Program.

13.2.3 PERSONNEL

Personnel are responsible for:

- Overseeing implementation of the Confined Space Program during field operations;
- Reporting confined space work activity, and any violations of the Confined Space Program, to the Site Manager and the HSC;
- Familiarizing themselves with the Confined Space Program and following it;
- Becoming familiar with the criteria for determining a confined space, and with the monitoring, permitting, and other requirements of the program; and
- Reporting immediately a confined space condition to the HSC.

13.3 DEFINITION OF A CONFINED SPACE

Confined space is one that:

- Is large enough and so configured that an employee can bodily enter and perform assigned work;
- Has limited or restricted means for entry or exit (such as pits, storage bins, hoppers, crawl spaces, and storm cellar areas); and
- Is not designed for continuous employee occupancy.

Any workspace meeting all of these criteria is a confined space and the Confined Space Program must be followed.

13.4 CONFINED SPACE ENTRY PROCEDURES

13.4.1 SAFETY WORK PERMIT REQUIRED

All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. The Confined Space Entry Permit (Form 13.1) for entry into a confined space must be completed before work begins; it verifies completion of the items necessary for confined space entry. The permit will be kept at the Site for the duration of the confined space work. If there is an interruption of work, or the alarm conditions change, a new permit must be obtained before work begins.

A permit is not required when the space can be maintained for safe entry by 100% fresh air mechanical ventilation. This must be documented and approved by the HSC. Mechanical ventilation systems, where applicable, shall be set at 100% fresh air.

The HSC must certify that all hazards have been eliminated on the Confined Space Entry Permit. If conditions change, a new permit is required.

13.4.2 PRE-ENTRY TESTING FOR POTENTIAL HAZARDS

a. Surveillance

Personnel first will survey the surrounding area to assure the absence of hazards such as contaminated water, soil, or sediment, barrels, tanks, or piping where vapors may drift into the confined space.

b. Testing

No personnel will enter a confined space if any one of these conditions exists during pre-entry testing.

Determinations will be made for the following conditions:

1. Presence of toxic gases or dusts: Equal to or more than 5 parts per million (ppm) on a photo-ionization unit with an alarm, above background outside the confined space area; or other action levels for specific gases, vapors, or dusts as specified in the Health and Safety Plan and the Confined Space Permit based on knowledge of Site constituents;

2. Presence of explosive/flammable gases: Equal to or greater than 10% of the Lower Explosive Limit (LEL) as measured with a combustible gas indicator or similar instrument (with an alarm); and
3. Oxygen Deficiency: A concentration of oxygen in the atmosphere equal to or less than 19.5% by volume as measured with an oxygen meter.

Pre-entry test results will be recorded and kept at the Site for the duration of the job by the HSC. Affected personnel can review the test results.

c. Authorization

Only the HSC or designee can authorize any personnel to enter into a confined space. This is reflected on the Safe Work Permit for entry into a confined space. The HSC must assure that conditions in the confined space meet permit requirements before authorizing entry.

d. Safe Work Permit

A Safe Work Permit for confined space entry must be filled out by the HSC or designee. A copy of the Safe Work Permit is included as Form 5.2.

e. Attendants

One worker will stand by outside the confined space ready to give assistance in the case of an emergency. Under no circumstances will the standby worker enter the confined space or leave the standby position. There shall be at least one other worker not in the confined space within sight or call of the standby worker.

f. Observation and Communication

Communications between standby worker and entrant(s) shall be maintained at all times. Methods of communication that may be specified in the Safe Work Permit and the HASP may include voice, voice by powered radio, tapping or rapping codes, signaling tugs on rope, and standby worker's observations that activity appears normal.

13.4.3 RESCUE PROCEDURES

Acceptable rescue procedures include entry by a team of rescuers only if the appropriate self-contained breathing apparatus (SCBA) is available; or use of public emergency services. The standby worker must be trained in first aid, CPR, and respirator use. A first aid kit should be on hand and ready for emergency use. The standby worker must be trained in rescue procedures. Retrieval of an unconscious victim in a confined space will only be conducted by trained rescue personnel. An emergency call to 911 will be initiated to assist the victim.

13.5 TRAINING

Personnel who will engage in field activities will be given annual training on the requirements and responsibilities in the Confined Space Program and on OSHA 1910.146. Only trained personnel can work in confined spaces. Workers should be experienced in the tasks to be performed, instructed in proper use of respirators, lifelines and other equipment, and practice emergency procedures and self-rescue.

Before each Site activity, the determination of confined space work will be part of the Site characterization process. Training in the Site-specific confined space activities will be part of the Site-specific health and safety training.

13.6 SAFE WORK PRACTICES

- Warning signs should be posted. These include warnings for entry permits, respirator use, prohibition of hot work and emergency procedures and phone numbers.
- Cylinders containing oxygen, acetylene or other fuel such as gasoline must be removed a safe distance from the confined space work area.
- Purging and ventilating is done before work begins to remove hazardous vapors from the space. The space should be monitored to ensure that the gas used to purge the space (e.g. tank) has also been removed. Local exhaust should be used where general exhaust is not practical.
- The buddy system is used at all times. A standby person always must be posted within sight of, or in communication with, the person inside the confined space. The standby should not enter the confined space, but instead will call for help in an

emergency and not leave the post. Communication should be maintained at all times with workers inside the confined space.

- Emergency planning in the HASP and a Safe Work Permit must be approved in advance and the proper rescue equipment must be immediately available.

14.0 ELECTRICAL SAFETY

14.1 EQUIPMENT/ELECTRICAL HAZARDS

Electricity may pose a particular hazard to Site workers due to the use of portable electrical equipment. When electrical work is needed, it must be performed by a qualified electrician.

General electrical safety requirements are outlined in Appendix K and include:

i) all electrical wiring and equipment must be a type listed by Underwriters Laboratory (UL), Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency;

ii) all installations must comply with the National Electrical Safety Code (NESC), the National Electrical Code (NEC), or United States Coast Guard regulations;

iii) portable and semi-portable tools and equipment must be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle;

iv) tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double insulated tools must be distinctly marked and listed by UL or FM;

v) live parts of wiring or equipment must be guarded to prevent persons or objects from touching them;

vi) electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching;

vii) all circuits must be protected from overload;

viii) temporary power lines, switch boxes, receptacle boxes, metal cabinets, and enclosures around equipment must be marked to indicate the maximum operating voltage;

ix) plugs and receptacles must be kept out of water unless of an approved submersible construction;

x) all extension outlets must be equipped with ground fault circuit interrupters (GFCIs);

xi) attachment plugs or other connectors must be equipped with a cord grip and be constructed to endure rough treatment;

xii) extension cords or cables must be inspected prior to each use, and replaced if worn or damaged. Cords and cables must not be fastened with staples, hung from nails, or suspended by bare wire;

xiii) flexible cords must be used only in continuous lengths without splice, with the exception of molded or vulcanized splices made by a qualified electrician; and

xiv) Electrical Safety will be adhered to as minimum requirements to be followed by all Site personnel, including subcontractors. Electrical inspections are to occur during initial Site setup and monthly thereafter. These inspections are to be documented via either the Superintendent's logbook, the Site HSC's logbook.

14.2 LOCKOUT/TAGOUT

The HSC or designee must approve all work in areas requiring lockout/tagout procedures. Specific procedures and permitting requirements will be specified in the HASP, or in a revised HASP based on the need for a worker to work around electrical equipment.

All systems must be locked out and tagged before the work begins. This includes pipes, air lines, electrical equipment and mechanical devices. The equipment must be start tested and approved for use by a worker by the HSC or designee by start-testing to make sure the locked-out equipment does not operate.

BASE SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE; CHICAGO LOOP, ILLINOIS 1997

0 1,000 2,000ft

figure 2.1

SITE LOCATION
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(H&S)GN-CO001 FEB 25/2004

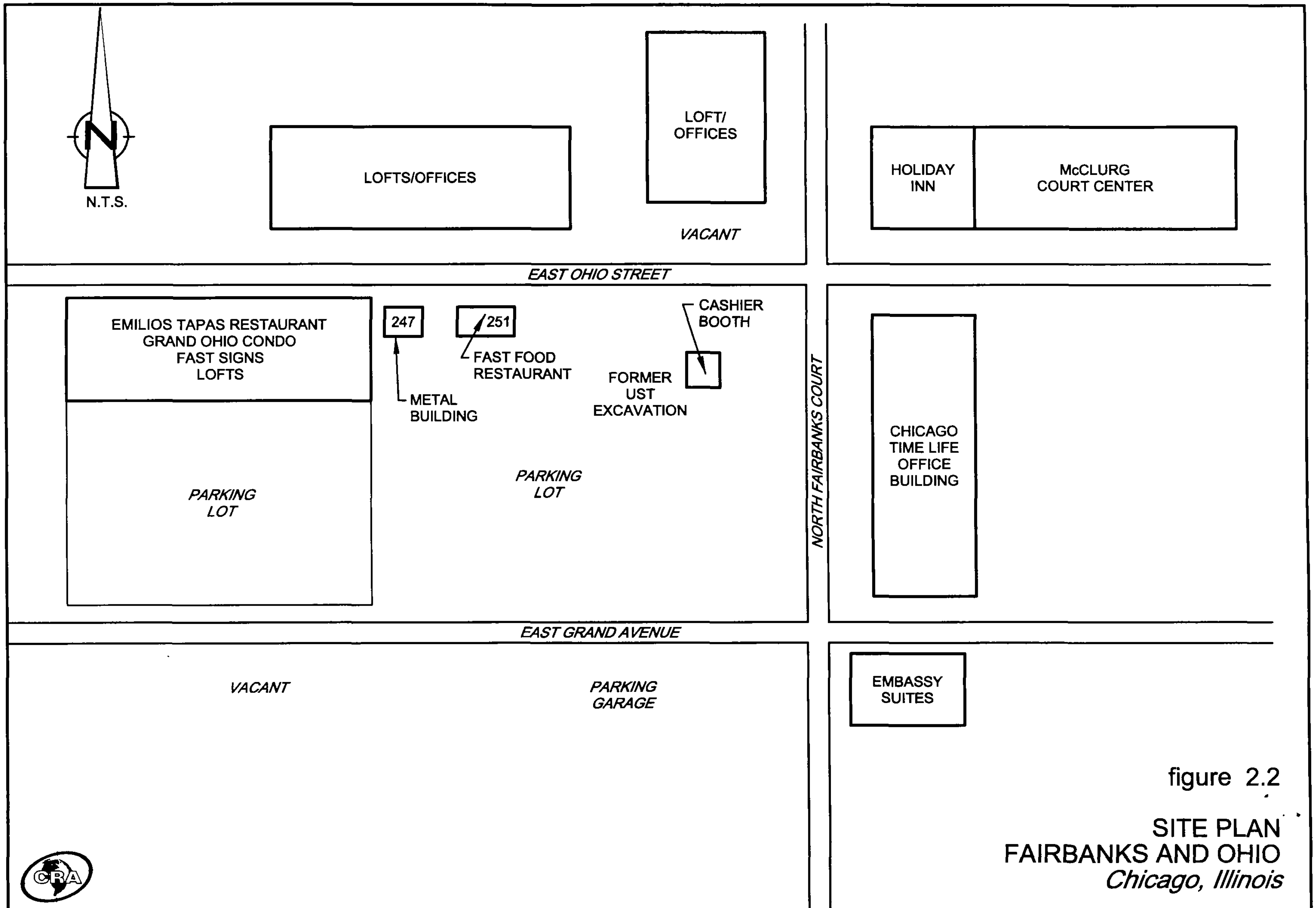
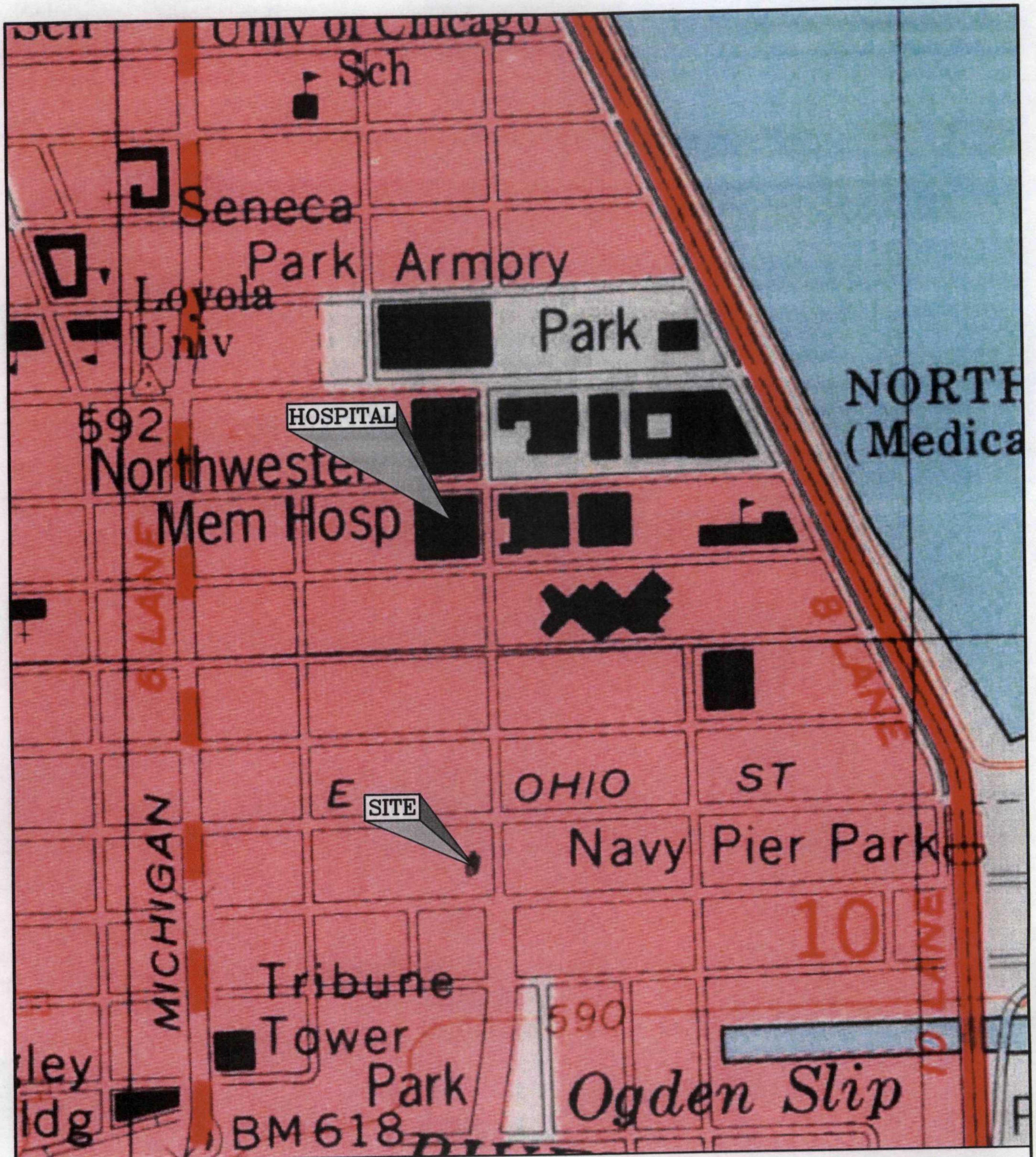


figure 2.2

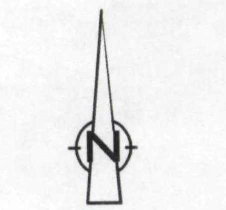
SITE PLAN
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(H&S)GN-CO003 FEB 25/2004



DIRECTIONS

1- EAST ON E OHIO STREET
2- LEFT ONTO N FAIRBANKS COURT
3- LEFT ONTO E ONTARIO STREET
4- RIGHT ONTO N ST CLAIR STREET
5- RIGHT ONTO E ERIE STREET
APPROXIMATE DISTANCE 0.36 MILES
APPROXIMATE TIME 2 MINUTES

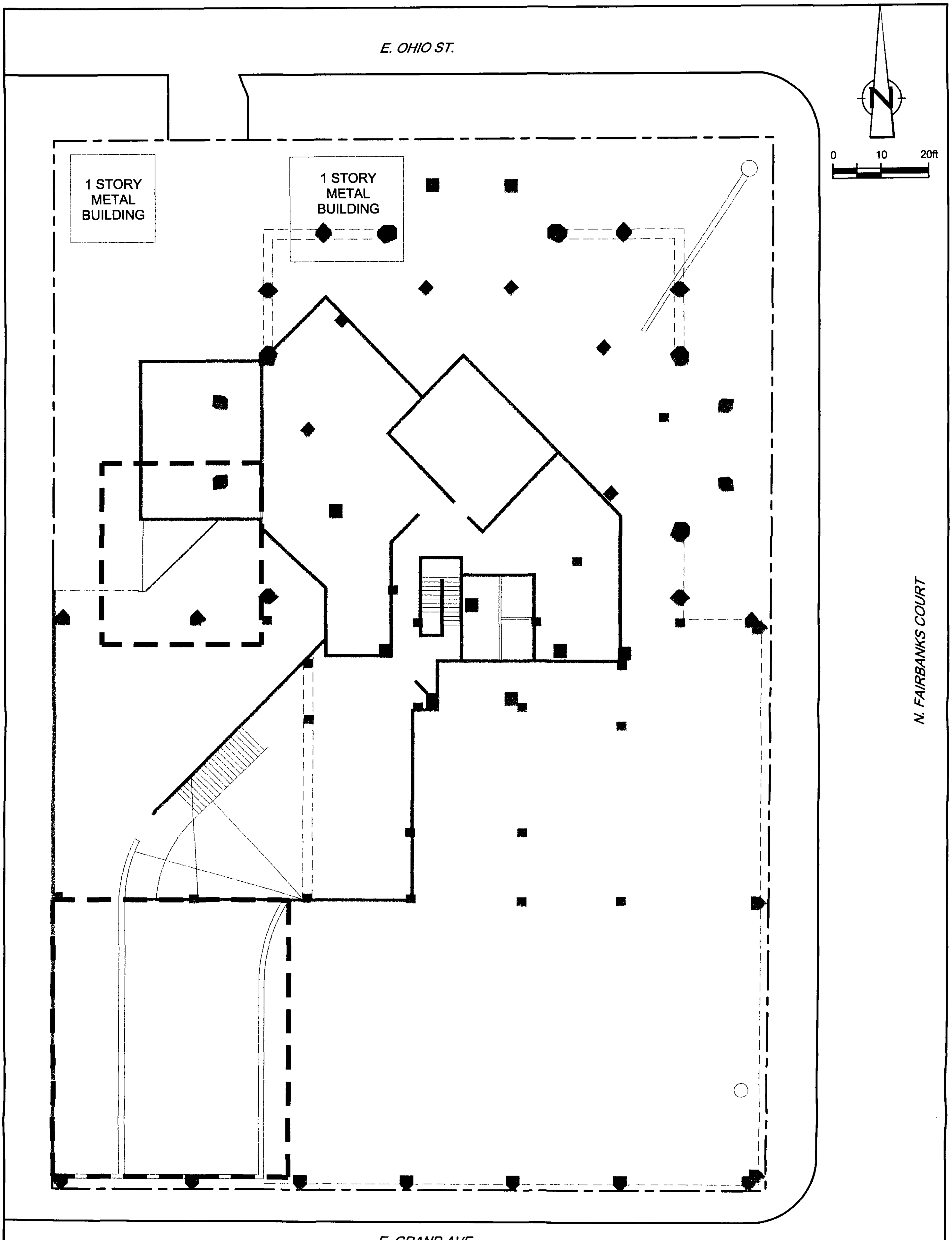


BASE SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE; CHICAGO LOOP, ILLINOIS 1997

figure 2.3

HOSPITAL ROUTE MAP
FAIRBANKS AND OHIO
Chicago, Illinois

17770-00(H&S)GN-CO002 FEB 25/2004



LEGEND

EXCLUSION ZONES

Figure 3.1

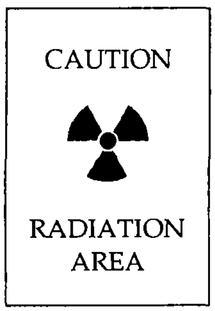
IMPACTED AREAS WHERE EXCLUSION ZONES
MAY BE ESTABLISHED
FAIRBANKS AND OHIO
Chicago, Illinois

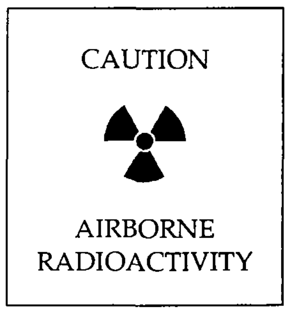
17770-00(H&S)GN-CO004 FEB 25/2004

FORM 1.1

VISITOR INFORMATION SHEET
VISITOR INFORMATION
NOTICE : ALL VISITORS MUST BE ESCORTED AT ALL TIMES WHILE ON THIS SITE.

CAUTION: Radioactive materials may be present on this site. Radioactive materials may be found throughout the site.





CONTROLLED AREAS: Do not enter areas with these signs unless you have an escort or health physics has given specific approval and you understand access limitations. No smoking, eating, drinking or chewing in controlled areas.

You must wear protective clothing in controlled areas.
Health physics will provide you with instructions.

You must wear a personal radiation dosimeter if you enter an area that is controlled.

No smoking, eating, drinking or chewing in controlled areas. NO EXCEPTIONS.

Name______________________________________ Date __________________

017770 (2) AP-G

FORM 4.1

ACCIDENT/EXPOSURE INVESTIGATION REPORT

COMPANY		DATE
INVESTIGATION TEAM		
EMPLOYEE'S NAME & ID		
SEX	AGE	JOB DESCRIPTION
DEPARTMENT & LOCATION		
ACCIDENT DATE & TIME		
DATE & TIME ACCIDENT REPORTED TO SUPERVISOR		
NATURE OF INCIDENT		
NATURE OF INJURY		
REFERRED TO MEDICAL FACILITY/DOCTOR ☐ YES ☐ NO		
EMPLOYEE RETURNED TO WORK ☐ YES DATE/TIME ________________________ ☐ NO		
☐ INJURED EMPLOYEE INTERVIEW/STATEMENT – ATTACHED		
WITNESSES		
☐ WITNESSES INTERVIEWS/STATEMENTS – ATTACHED		
☐ PHOTOGRAPHS OF SITE – ATTACHED		
☐ DIAGRAMS OF SITE - ATTACHED		
EQUIPMENT RECORDS – ATTACHED - REVIEWED ☐ YES ☐ NO		
ACCIDENT/EXPOSURE INCIDENT DESCRIPTION		

FORM 4.1

ACCIDENT/EXPOSURE INVESTIGATION REPORT

ACCIDENT DESCRIPTION		
DATE & TIME	LOCATION	
PREVENTATIVE ACTION RECOMMENDATIONS		
CORRECTIVE ACTIONS COMPLETED	MANAGER RESPONSIBLE	DATE COMPLETED

EMPLOYEE LOST TIME - TEMPORARY HELP - CLEANUP - REPAIR – DISCUSSION			
ACCIDENT COST ANALYSIS	INVESTIGATION	COMPLIANCE	TOTAL COST
MEDICAL			
PRODUCTION LOSS			

REPORT PREPARED BY	DATE COMPLETED
SAFETY COMMITTEE REVIEW ☐ YES ☐ NO	
CORRECTIVE ACTION	DATE STARTED
SAFETY COMMUNICATION NOTICE PREPARED	DATE
SAFETY DIRECTOR SIGNATURE	

FORM 4.1

ACCIDENT/EXPOSURE INVESTIGATION REPORT

ACCIDENT DESCRIPTION	
DATE & TIME	LOCATION
EMPLOYEES INVOLVED	
EMPLOYEE INTERVIEW/STATEMENT - INJURED EMPLOYEE – WITNESS	
EMPLOYEE NAME	
INTERVIEWED BY	

ACCIDENT DIAGRAM/PHOTOGRAPHS

FORM 5.1

SAFETY MEETING REPORT (PAGE 1 OF 2)

<table>
<tr><td rowspan="2">DATE</td><td rowspan="2">DIVISION</td><td rowspan="2">DEPARTMENT</td><td colspan="2">DURATION OF MEETING</td></tr>
<tr><td>FROM:
□ A.M.
□ P.M.</td><td>TO:
□ A.M.
□ P.M.</td></tr>
<tr><td>NUMBER PRESENT</td><td>NUMBER ABSENT</td><td>MEETING CONDUCTED BY</td><td colspan="2">DID MEETING INCLUDE REQUIRED TRAINING?
□ YES (DESCRIBE BELOW) □ NO</td></tr>
</table>

SUPERVISOR'S PRESENTATION	DISCUSSION OF SAFE/UNSAFE WORK PRACTICES, MATERIALS, PRECAUTIONS, HAZARDS, EQUIPMENT FAMILIARIZATION, ETC.
EMPLOYEE FEEDBACK	COMMENTS, QUESTIONS, COMPLAINTS, ETC.
SUPERVISOR'S CORRECTIVE ACTION PLAN	KNOWN PLANS FOR CORRECTION, PARTS ON ORDER, ITEMS TO BE DISCUSSED WITH DEPARTMENT HEAD, AND CORRECTION OF ITEMS PREVIOUSLY SUBMITTED
DEPARTMENT HEAD COMMENTS	

SUPERVISOR	DEPARTMENT HEAD
FACILITY MANAGER	HAVE EMPLOYEES ATTENDING SIGN ON REVERSE SIDE, FORWARD A COPY TO THE LOCAL SAFETY DEPARTMENT

FORM 5.1

SAFETY MEETING REPORT

To Be Signed by All Employees Attending The Meeting			
I have received and understand the information and / or training indicated on the reverse side.			
Signature	**Date**	**Signature**	**Date**

List All Employees Absent from the Meeting	

SAFE WORK PERMIT

Site: ____________ (CPP. TRA, RWMC, etc.) ☐ Construction ☐ Operations No.: ____________

Section I - To Be Completed By Job Supervisor

Emergency Contact/Phone: INEEL Site: 777; Idaho Falls: 9-911; Other: ____________

Job Supervisor/Company: ____________ Phone: ____________

Project Manager: ____________ Phone: ____________

Work Order/Contract No.: ____________ Job Location (Bldg. & Rm.): ____________

Job Title/Description (Be Specific):

Start Date/Time: ____________ Expiration Date/Time: ____________ Extended To: (Date/Time) ____________

DESCRIPTION OF HAZARD

Y	N	Hazard	Y	N	Hazard	Y	N	Hazard	Y	N	Hazard
☐	☐	1. Dust/Mists/Fumes List: ____	☐	☐	5. Flammable/Combustible Material	☐	☐	7. Height - Elevated Work	☐	☐	11. Heat/Cold
									☐	☐	12. Noise
☐	☐	2. Chemical List: ____	☐	☐	6. Energy ☐ Steam ☐ Electrical ☐ Mechanical ☐ High Pressure ☐ Temperature	☐	☐	8. Hoisting & Rigging	☐	☐	13. Repetitive Motion
						☐	☐	9. Excavation *	☐	☐	14. Radiation/Contamination*
☐	☐	3. Hazardous Atmosphere				☐	☐	10. Confined Space * ☐ Permit Required ☐ Non-Permit Required	☐	☐	15. Laser
☐	☐	4. Welding, Cutting, Grinding, Burning							☐	☐	16. Other: ____

***Other permits may be required**

PROTECTION REQUIREMENTS

☐ 1. Personal Protective Equipment (PPE)
- ☐ Head: ____________
  - ☐ Head
  - ☐ Other: ____________
- ☐ Eye/Face
  - ☐ Safety Glasses w/Sideshields
  - ☐ Chemical/Burning Goggles
  - ☐ Face Shield/Welding Shield
  - ☐ Other: ____________
- ☐ Body: ____________
  - ☐ Chemical ☐ Thermal
  - ☐ Coveralls ☐ Fire Resistant
  - ☐ Other: ____________
- ☐ Hands: ____________
  - ☐ Acid Resistant ☐ Solvent Resistant
  - ☐ Oil Resistant ☐ Leather
  - ☐ Abrasion, Cut & Tear Resistant
  - ☐ Temperature Resistant
  - ☐ Other: ____________
- ☐ Foot:
  - ☐ Safety Shoes/Boots
  - ☐ Leather Above Ankle
  - ☐ Other: ____________

☐ 2. Electrical/Mechanical Work
- ☐ Lockout/Tagout
- ☐ Justification for Live Work
- ☐ Personal Protective Equipment/Specify: ____________
- ☐ Other: ____________

☐ 3. Respiratory
- ☐ Supplied Air
  - ☐ Full Face ☐ Hood
  - ☐ Other: ____________
- ☐ Escape Bottle
- ☐ Air Purifying
  - ☐ Full Face ☐ Half Face
  - Cartridge/Canister Specify: ____________

☐ 4. Fire Protection

General
- ☐ Deactivate Fire Alarms (Notification Req.)
- ☐ Equipment in Good Repair
- ☐ Extinguisher Type: ____________
- ☐ Inspect Area

Precautions
- ☐ Remove/Protect Combustibles, Within 35'
- ☐ Purge/Clean Containers

Fire Watch
- ☐ Additional Person Required
- ☐ Trained on Equipment, Alarms, Fire Reporting
- ☐ Remain 30 Minutes After End of Hot Work
- ☐ Other: ____________

☐ 5. Hoisting and Rigging
- ☐ Tag Lines ☐ Equipment Inspection
- ☐ Critical Lift/Person-in-Charge
- ☐ Other: ____________

☐ 6. Excavation
- ☐ Sloping/Shoring ☐ PE License Required
- ☐ Barricading
- ☐ Other: ____________

☐ 7. Elevated Work/Open Hole
- ☐ Guardrail ☐ Travel Restriction
- ☐ Fall Protection Plan ☐ Fall Arrest
- ☐ Other: ____________

☐ 8. Support Help
- ☐ Backup Person ☐ Equipment
- ☐ Communication: ____________
- ☐ Other: ____________

☐ 9. Special Equipment
- ☐ Rescue ☐ Signs/Barricades
- ☐ Ventilation ☐ Lighting
- ☐ Other: ____________

☐ 10. Special Requirements
- ☐ Drain and Flush ☐ Bleed/Blank/Blind
- ☐ Glove Bag ☐ Work/Rest Regime
- ☐ Heat/Cold Stress Stay Times
- ☐ Other: ____________

Special Instructions/Other Protection:

SAFE WORK PERMIT

General

All entries must be completed in black ink.

Section 1

This section is to be completed by the job supervisor or designated alternate, who is responsible for the conduct of the overall work activity.

All spaces for job information must be filled out in legible manner. Enter N/A (not applicable) as appropriate.

The job title and description must clearly identify the work to take place.

Separate permits may be required for multiple tasks by different workers.

> Note: Form 432.30, Construction Work Authorization, local facility procedures, or facility management/supervision may specify the permit duration and expiration date/time.

Maximum permit duration is four weeks. One extension is allowed, provided that hazard conditions do not change, for up to the same period originally specified on the permit, but not to exceed a total of four weeks. (For example, a one day permit can only be extended one additional day, while a three week permit can be extended no more than one additional week.) If an extension is necessary to complete the job beyond the time approved, all required information and approvals identified on the permit must be reviewed. The reviewer's or alternate's initial and date adjacent to the original signature is sufficient to indicate review and re-approval.

Copies made for facility or field use must be marked or stamped with the word "copy".

> Note: Work is not to proceed if the requirements identified cannot be followed or if other safety hazards exist that have not been addressed in this permit. New employees may be added to the SWP without obtaining revision or approval but they must receive an equivalent pre-job briefing as given to previous employees listed on the SWP.

Description of Hazard

Check either a Y for yes or a N for no in the box adjacent to each listed hazard.

For No. 5, Chemical., list specific chemical(s) that may be encountered or may present a health or safety concern.

If the hazard description is not listed, identify the hazard on line No. 16, Other.

Protection Requirements

Mark boxes and additional requirements under Other, as appropriate. Where multiple choices exist per box, circle one or more of the protective requirements to show which option(s) has been chosen.

If an appropriate protective requirement is not listed, provide the appropriate protection requirement in the "Special Instructions/Other Protection" area.

FORM 5.3

SITE SAFETY PLAN

SUMMARY INFORMATION

DATE: ______________________ UPDATE: ______________________

PROJECT NAME: ______________________ PROJECT NO: ______________________

LOCATION: ______________________

SITE CONTACT AND PHONE NUMBER: ______________________

TYPE OF FACILITY: (active or inactive - describe previous use, previous agency action, soil type, topography, surrounding community)

____

PLAN PREPARED BY: ______________________

SITE SAFETY OFFICER: ______________________ CPR/FIRST AID TRAINED STAFF: ______________________

REVIEWED BY: ______________________ DATE: ______________________

WORK SCOPE/CONSTRUCTION/INVESTIGATION
Task 1 ______________________
Task 2 ______________________
Task 3 ______________________

PROPOSED START DATE: ______________________

UNUSUAL FEATURES/SITE SECURITY (include Site map): ______________________

UTILITIES: ☐ Marked ☐ Scheduled Meet Date ______________ Time ______________

ANALYTICAL DATA (to be summarized below or attached, if available)

____

____

CONFINED SPACE: ☐ Yes ☐ No (If yes, describe and address permitting and entry procedures in an attachment.)

____

____

AIR MONITORING:
Monitoring equipment: MiniRae meter with 10.6 eV lamp or ______________________
Action level = 15 PID units in breathing zone for Level C upgrade Stop work = 50 PID units in breathing zone.
☐ O_2 meter, ☐ FID, ☐ Detector tubes, ☐ L.E.L. meter, ☐ Other ______________________

Other action levels: ______________________

FORM 5.3

SITE SAFETY PLAN

PERSONAL PROTECTION: Level of Protection: ☐ A ☐ B ☐ C ☐ D
Special Requirements ______________________________

COMMUNICATION EQUIPMENT: (Mobile Phone or other phone location and number, etc.)

____

Scheduled Safety Meetings Interval: (daily, weekly, as needed)

SPECIAL SITE EMERGENCY COMMUNICATION PROCEDURES: (Evacuation signals, routes, spill containment)

HEAT/COLD STRESS CONTROLS:

SPECIAL PHYSICAL HAZARD CONTROLS: Barricades for work area, reflective vests, other, etc.

____

LOCAL EMERGENCY RESOURCES and telephone numbers
Emergency Eye Wash/Shower Location: ______________________________
Fire Extinguisher: ______________________________
Police: ______________________________
Fire Department: ______________________________
Poison Control: ______________________________
HOSPITAL: Northwestern Memorial Hospital
Address: 250 Erie Street , Chicago, IL 60611
Telephone: 1-312-926-5188
Directions (supply map): Head East on Ohio to N. Fairbanks Ct. Head North (Left) on N. Fairbanks Ct. to E. Huron (3 major streets). Turn West (Left) on E. Huron to St. Clair, South (Left) on St. Clair to Erie, and East (Left) to 250. The directions on foot are North on N. Fairbanks Ct. to Erie. West (Left) on Erie to 250.

____

EMERGENCY CONTACTS (name and phone number)
1. Construction Manager Contact: ______________________________
2. Owner Contact: ______________________________
3. Contractor Contact: ______________________________
4. Subcontractor Contact: ______________________________
5. Subcontractor Contact: ______________________________
6. ______________________________
7. ______________________________

PRE-ENTRY SAFETY BRIEFING
I have received and read the ______________________ Low Contamination Health and Safety Plan. I understand the plan and had the opportunity to ask questions. I understand the information and instructions in the plan. I understand that medicine can complicate the effects from exposure to toxic chemicals. If I am taking any prescription or over the counter medicine or have a current medical condition which may increase my risks, I will advise my supervisor or Site Safety Officer.

Signature	Responsibility	Date

FORM 5.4

TRAINING ACKNOWLEDGMENT FORM

Please Print:

NAME: ______________________________

ADDRESS: ______________________________

SOCIAL SECURITY NUMBER: ______________________________

EMPLOYER: ______________________________

JOB SITE: ______________________________

I have attended and understood the mandatory Site-specific initiation session for the above-referenced job site. This program referenced the following topics:

i) known potential hazards on Site;

ii) level of personal protection equipment required;

iii) emergency procedures for the Site; and

iv) have received explanation of the basics of the Health and Safety Plan.

I further confirm that I have the required 40 hours of training to comply with 29 CFR 1910.120 and have a respirator for which I have been fit tested.

____
Signature

FORM 13.1

CRA
CONFINED SPACE ENTRY PERMIT
Permit Date: ______/______/______
Site Name: ______________________
Job Number: ______________________

Emergency Phone Number: ______________________
Annual Permit ☐ Yes
CRA Office: ______________________
Entry Class (MN only) ☐ IA ☐ IB ☐ II ☐ III

Section 1: Personnel

Name	*Title*

Entrant:	Enters the confined space and performs the work.
Attendant:	Maintains direct communications with entrant(s).
Standby:	Supports job. Assists the attendant
Supervisor:	Fills out CSE permit. Responsible for and assures that permit is followed.

Note: One of the participants, other than the entrant, needs to have current first-aid and CPR certification.

Section 2: Confined Space Certifications (to be completed after sections 3, 4 and 9)

Based on the hazard assessment from Sections 3, 4 and 9, the following entry procedure will be followed:

☐ Non-Permit Entry (Sign 1 and 2) ☐ Alternate Entry (Sign 2 and 3) ☐ Permit Required Entry (Sign 3)

1. There are no real or potential atmospheric hazards:
   Signature ______ Date ______

2. There are no observable serious safety or health hazards:
   Signature ______ Date ______

3. I certify that all required precautions have been taken and necessary equipment and emergency response is provided for safety entry and work in this confined space:
   Signature ______ Date ______

Section 3: Confined Space Characteristics

Operations to be Performed:

Operations to be Performed:		☐ Tank Cleaning	☐ Tank Inspection	☐ Tank
Monitoring	☐ Sampling			
	☐ Tank Repair	☐ Hot Work	☐ Scraping/Removing	☐
Lock-out/Tag-out				
	☐ Secure Area	☐ Inerting/Degassing		☐
Grounding/Bonding	☐ Decon			
	☐ Other (specify) ______________________			

Confined Space Configuration: ☐ Aboveground Tank ☐ Vertical Tank ☐ Storag
☐ Underground Tank ☐ Horizontal Tank ☐ Tote Tank ☐ Tanker/Vac
Truck
☐ Mixing Tank ☐ Shaker Tank ☐ Excavation/Trench ☐
Pit/Culvert/Vault
☐ Other (specify) ______________________________

Confined Space Type Material: ☐ Stainless Steel ☐ Fiberglass ☐ Carbon Steel ☐ Brick
☐ Cast Iron ☐ Aluminum ☐ Concrete ☐ Soil
☐ Other (specify) ______________________________

Section 4: Chemical and Physical Hazards

Material Name:* ____________________

Material State: ☐ Solid ☐ Liquid ☐ Gas ☐ Sludge

Chemical Hazards: ☐ Corrosive ☐ Volatile ☐ Oxidizer ☐ Toxic
☐ Radioactive ☐ Biological ☐ Reactive ☐ Inert
☐ Flammable ☐ Combustible ☐ Poison Gas ☐ Non-Haz
☐ Other (specify) ____________________

Physical Hazards: ☐ Physical Exertion ☐ Heat Stress ☐ Cold Stress ☐ Heavy
Equipment

☐ Fire Hazards ☐ Lifting Hazards ☐ Slip, Trip, Fall ☐ High Noise
☐ Overhead Hazard ☐ Underground Hazard ☐ Fall Protection ☐ Electr
☐ Hand/Power Tools ☐ Welding/Cutting ☐ Sparks ☐ Grinding
☐ Explosive ☐ Visibility ☐ Respiratory (dust) ☐ Splash
☐ Flying Debris ☐ Pinch, Grab, Roll ☐ Internal Obstruction ☐ Oxygen
Deficient

☐ Engulfment ☐ Other (specify) ____________________

*Note: The health effects of the contaminant(s) need to be discussed with the team prior to entry.
Smoking is prohibited within 20 feet of a confined space.

Section 5: Support Equipment

Emergency Equipment: ☐ First-Aid Kit ☐ Retrieval System Line ☐ Lifeline ☐ Alarm
☐ Portable Eyewash ☐ Tripod Winch ☐ Rescue Package ☐ Full Body
Harness

☐ Emergency Shower ☐ Fall Protection Device ☐ FM Radios ☐ In Ma

Other Support Equipment: ☐ Decon Setup ☐ Spark Resistant Tools ☐ Power Washer
w/Hoses
☐ Cooling Vests
☐ Air Compressor ☐ Air Power Tools ☐ Rope Ladder ☐ Intrinsic
Lighting

Ventilation Requirements: ☐ Ventilation required ☐ Ventilation not required

Note: MN requires a hoist and harness for all Class II and III entries and otherwise for all permit-required entries greater than 5 feet. An eyewash is needed if the CS contains corrosives.

Section 6: Emergency Response Support for Permit Required Spaces

IDLH Conditions are Present or Possible: ☐ Yes ☐ No
Note: If Yes, then responders must be on site during entry.

Name and Phone Number of Emergency Responders: ____________________

____

Called Responders to Brief and Confirm Availability: ☐ Yes ☐ No ☐ Not A

Equipment Needed: ____________________

____

See Page 5 for Responder Evaluation Form

Section 7: Lock-Out/Tag-Out/Isolation

Pipes/Valves	☐ Yes	☐ No	☐ N/A	Pipes/valves closed, multiple locked, and tagged.	Initials: _
	☐ Yes	☐ No	☐ N/A	Pipes blanked.	Initials: ________
	☐ Yes	☐ No	☐ N/A	Vents/drains blocked.	Initials: ________
Electrical	☐ Yes	☐ No	☐ N/A	Switches / Lines off, multiple locked, and tagged.	Initials: _
Mechanical	☐ Yes	☐ No	☐ N/A	Pumps, motors and other mechanical devices off, multiple locked, and tagged.	Initials: ________

Section 8: Personal Protective Equipment Assessment

	Entrant	Attendant	Standby
Level of Protection	A B C D Modified	A B C D Modified	A B C D Modified
Respiratory Protection	☐ Fullface APR Cart: ______ ☐ SCBA ☐ Air Line ☐ None Needed	☐ Fullface APR Cart: ______ ☐ SCBA ☐ Air Line ☐ None Needed	☐ Fullface APR Cart: ______ ☐ SCBA ☐ Air Line ☐ None Needed
Barricade Protective Clothing CPF III	☐ Uniform/Coveralls ☐ Tyvek ☐ Barricade ☐ CPF I ☐ CPF II ☐ CPF III ☐ CPF I ☐ CPF II ☐ CPF III ☐ Level A ☐ Other__	☐ Uniform/Coveralls ☐ Tyvek ☐ Barricade ☐ Level A ☐ Other____	☐ Uniform/Coveralls ☐ Tyvek ☐ ☐ CPF I ☐ CPF II ☐ ☐ Level A ☐ Other____
Palm Gloves	☐ Cloth ☐ Leather Palm ☐ Latex ☐ Nitrile ☐ PVC ☐ PVA ☐ Neoprene ☐ Other______	☐ Cloth ☐ Leather Palm ☐ Latex ☐ Nitrile ☐ PVC ☐ PVA ☐ Neoprene ☐ Other______	☐ Cloth ☐ Leather ☐ Latex ☐ Nitrile ☐ PVC ☐ PVA ☐ Neoprene ☐ Other______
Glasses Head/Face/Eye	☐ Hard Hat ☐ Safety Glasses ☐ Hard Hat ☐ Safety Glasses ☐ Face Shield ☐ Goggles ☐ Other______	☐ Face Shield ☐ Goggles ☐ Other______	☐ Hard Hat ☐ Safety ☐ Face Shield ☐ Goggles ☐ Other______
Foot/Leg Protection	☐ Steel Toe Shoe/Boot ☐ Steel Toe PVC ☐ Rubber Overboots ☐ Other______	☐ Steel Toe Shoe/Boot ☐ Steel Toe PVC ☐ Rubber Overboots ☐ Other______	☐ Steel Toe Shoe/Boot ☐ Steel Toe PVC ☐ Rubber Overboots ☐ Other______

Note: An SCBA is required on standby for all MN Class III entries.

Section 9: Air Monitoring

Monitoring Equipment: ☐ CGA ☐ PID ☐ FID ☐ O_2 ☐ H_2S ☐ CO
☐ Colorimetric Tubes (Which: ________________________________)
☐ Other ________________________________

The listed equipment was calibrated in accordance with the recommended manufacturer's guidelines by: __________

Notes: ________________________________

Test Atmosphere	Action Guidelines - Time:							
Combustible Gas	0 - 5% Entry Safe 5 - 10% Enter Cautiously >10% No Entry, Contact IH							
Oxygen	20.0 - 22.0% Safe Entry <20.0% Level B Only >22% No Entry, Contact IH							
Organic Vapor	Contact IH for Compound-Specific Action Guidelines							

Carbon Monoxide	0 - 35 ppm Entry Safe >35 ppm Supplied Air required							
Hydrogen Sulfide	0 - 5 ppm Entry Safe >5 ppm Supplied Air required							

Section 10: Permit Review and Acknowledgment

I understand that I have reviewed this permit and know my job function and procedures necessary to accomplish this task safely.

Print Name	Signature	Print Name	Signature
1.		5.	
2.		6.	
3.		7.	
4.		8.	

Section 11: Task Completion and Permit Close-Out

Verification of System Line Restoration (Removal of locks, tags, blanks, blocks, etc.) ☐ Yes ☐ No ☐ N/A

Comments:

Entry Supervisor (Print and Sign Name) Date/Time

This Permit must be sent to the IHSG. Confined Space entry permits must be kept on file for a period of 1 year. If there are any questions call the IHSG. Copies may be placed in the project file if required.

Section 12: Health and Safety Review (Post Job Review)

Reviewed by:

Health and Safety Department (Print and Sign Name) Date/Time

Comments:

CRA EVALUATION FORM
FOR EMERGENCY RESCUE SERVICES
IN PERMIT REQUIRED CONFINED SPACES

Directions: This evaluation must be completed initially and then annually for sites and/or facilities which rely on community/local rescue services to provide emergency rescue services to their permit-required confined spaces. The rescue service should visit each site and/or facility to view all permit-required confined spaces and review their potential hazard(s). All questions must be answered satisfactorily in order to be able to list 911 on the CS permit and rely on the rescue service. It is acceptable to work with and assist rescue services in achieving a satisfactory evaluation.

Name of Service: ______________________ Contact's Name: ______________________

Emergency Phone No.: ______________________ Business Phone No.: ______________________

		Yes	*No*
1.	Does the rescue service have the ability, in terms of proficiency, with rescue-related tasks and equipment?	☐	☐
2.	Will the rescue service stand by (on site) at the permit space for IDLH or potential ILDH atmospheres? The cost for providing this service is $______________.	☐	☐
3.	Can the rescue service respond in a 10 to 15-minute timeframe for non-IDLH situations (i.e., mechanical hazards that may cause broken bones, abrasions, etc.)? The availability of the rescue service is (i.e., 24 hours a day or are there times when key personnel would not be available)? ______________	☐	☐
4.	Does the rescue service:		
	A. Provide all required PPE and equipment that may be needed at the site and/or facility? If no, CRA will provide. ______________________________________.	☐	☐
	B. Train rescue personnel annually in accordance with the standard?	☐	☐
5.	Will the rescue service commit to providing rescue services to the site and/or facility?	☐	☐
6.	Is there an adequate method of communication between the attendant and rescue service to summon help?	☐	☐
7.	Has the rescue service practiced rescues or successfully performed a permit space rescue within the last 12 months?	☐	☐

Evaluation Completed By:

______________________ ______________________ ______________

Name (Print) Signature Date

TABLE 1.0

EMERGENCY PHONE NUMBERS
IN THE EVENT OF AN EMERGENCY DIAL 911

AMBULANCE SERVICE	911
FIRE DEPARTMENT	911
EMERGENCY RESCUE SERVICE	911
POLICE DEPARTMENT	911
NATIONAL RESPONSE CENTER	1-800-424-8802
POISON CONTROL CENTER	1-800-732-2200
NEAREST HOSPITAL - NORTHWESTERN MEMORIAL HOSPITAL	1-312-926-5188
ILLINOIS DEPARTMENT OF NUCLEAR SAFETY (IDNS) EMERGENCY NUMBER	(217) 785-0600
PROJECT COORDINATOR	
ILLINOIS EMERGENCY MANAGEMENT	(217) 782-7860
U.S.EPA REGION V - 24-HOUR EMERGENCY NUMBER	(312) 353-2318

TABLE 2.1

COMPOUNDS OF CONCERN
EAST OHIO STREET AND FAIRBANKS COURT
CHICAGO, ILLINOIS

Compound of Concern	Ionization Potential	Maximum Detected in prior Ground Water monitoring in PPM	Maximum Detected in prior Soil Testing in PPM	Exposure Routes	ACGIH 8-Hr. TLV in PPM	ACGIH STEL in PPM	OSHA8-Hr. PEL in PPM	OSHA Ceiling (15-min.) in PPM
Benzene	9.24 eV	1.5	<0.002	Inhalation, Skin, Ingestion	0.5	2.5	1	5
Ethyl benzene	8.76 eV	5.63	17.76	Inhalation, Ingestion	100	125	100	None
Toluene	8.82 eV	3.73	3.04	Inhalation, Skin, Ingestion	50	None	200	None
Xylene – o,m,p	8.44 – 8 .56 eV	21.87	82.58	Inhalation, Ingestion	100	150	100	None

TABLE 7.1

ACTION LEVELS AS DETERMINED BY RADIOACTIVITY

Note: Personnel shall not be exposed to airborne radioactivity such that their weekly intake exceeds 12 Maximum Permissible Concentration (MPC)-hours without prior approval of the Field Team Leader or designee. The MPCs are the inhalation values used in 29 CFR 1910.1096. The inhalation values incorporated in 29 CFR 1910.1096 are those that were in 10 CFR 20 in 1971 when OSHA promulgated the standard. Level of protection may be increased to Level C (full-face air purifying respirator) when airborne monitoring indicates that airborne concentration of radioactive material reached 30% of the MPC. All assessments shall incorporate ALARA principles. Engineering controls shall be used prior to assignment of respiratory protective equipment.

Areas where airborne radioactivity levels exceed, or have a reasonable potential to exceed, 25% of the MPC averaged over on week, or exceeds the MPC at any time shall be posted "Caution: Airborne Radioactivity Area".

Radiation Type	Action Level	Level of Respiratory Protection/Action
a. Contamination on smear samples	0.3 times the levels in Table 7.2[a] in Unrestricted Areas or 3 times the level in Restricted Areas	Consider contamination control
b. Airborne Radioactivity	12 MPC hours in a week	Consider Level C (full-face APR) based upon ALARA evaluation[b]. Ensure proper posting. Consider internal monitoring
c. Ambient Gamma (work areas)	5 mrem/hr[c] or 100 mrem in a week	Consider procedures for shielding of soils. Ensure proper posting.
d. Ambient Gamma (off-site areas)	1 mrem/hr[d] or 50 mrem in a year	Implement immediate controls to reduce dose equivalent rate.

Notes

(a) The values in Table 7.2 are from 32 IAC 340.APPENDIX A Decontamination Guidelines.

(b) Potential Airborne Radioactivity Area as defined in 29 CFR 1910.1096 (e)(4). Workers exposed to 32 MPC-hours in a week must wear modified Level C (full-face APR) until the end of the week..

(c) The ambient gamma dose equivalent rate action level of 5 mrem/hr is from 29 CFR 1910.1096 (c)(3)(ii) Radiation Area definition. If the ambient gamma dose equivalent rate reaches 2 mrem/hr, one or more of the following actions may be implemented: The source may be shielded; the working distance from the source may be increased; or the worker's exposure time may be limited.

(d) The ambient gamma action level for off-site is based upon the 32 IAC 340 Subpart D requirements to maintain dose equivalents in unrestricted areas such that they do not exceed 0.002 rem in any one hour or 0.1 rem in any one year.

TABLE 7.2

ACTION LEVELS

The values listed in 32 IAC 340.APPENDIX A Decontamination Guidelines are used in determining that areas are suitable for release for unrestricted use. The APPENDIX A Surface Contamination Guide values for alpha emitters are reproduced below.

Alpha emitters

	Removable	555 mBq per 100 cm^2 =	average
		15 pCi per 100 cm^2	over any
		33 dpm per 100 cm^2	one surface
		1.67 Bq per 100 cm^2 =	maximum
		45 pCi per 100 cm^2	
		100 dpm per 100 cm^2	
	Total	16.7 Bq per 100 cm^2 =	average
	(Fixed)	450 pCi per 100 cm^2	over any
		1,000 dpm per 100 cm^2	one surface
		83.3 Bq per 100 cm^2 =	maximum
		2,250 pCi per 100 cm^2	
		5,000 dpm per 100 cm^2	

TABLE 9.1

ON-SITE AIR MONITORING PROGRAM ACTION LEVELS
EAST OHIO STREET AND FAIRBANKS COURT
CHICAGO, ILLINOIS

MONITORING DEVICE	ACTION LEVEL	ACTION
Combustible Gas Indicator	>10 Percent LEL	Cease operations and move to a safe place. Notify HSC. Do not continue working until conditions are constantly below 10 percent of the LEL.
Oxygen Meter	< 19.5 Percent or > 23.5 Percent	Cease operations and move to a safe place. Notify HSC. Do not continue working until oxygen levels are between 19.5 and 23.5 percent.
Photoionization Detector (PID)	Benzene present in the Work Zone:	
	<1.0 ppm or Background	Full-face respirator available
	1.0 ppm and ≤ 25 ppm	Full-face, air purifying respirator Level C PPE.
	> 25 ppm and <500 ppm	Supplied air respirator, Level B PPE. Implement additional engineering controls.
	≥ 500 ppm	Shut down activities. Notify HSE. Implement additional engineering controls.
	Benzene NOT present in the Work Zone:	
	<10 ppm or Background	Full-face respirator available
	≥ 10 ppm and ≤ 250 ppm	Full-face, air purifying respirator Level C PPE.
	≥ 250 ppm and <1000 ppm	Supplied air respirator, Level B PPE. Implement additional engineering controls.

	≥ 1000 ppm	Shut down activities. Notify HSC. Implement additional engineering controls.
Dust / Particulate	<5 mg/m^3 or Background ≥ 5 mg/m^3 and < 50 mg/m^3 ≥ 50 mg/m^3	Full-face respirator available Full-face, air purifying respirator Level C PPE. Supplied air respirator, Level B PPE. Implement additional engineering controls.
Hydrogen Sulfide	> 5 ppm	Shut down activities. Notify HSC. Implement additional engineering controls.
Carbon Monoxide	> 35 ppm	Shut down activities. Notify HSC. Implement additional engineering controls.

<u>Notes:</u>

HSC Health and Safety Coordinator
LEL Lower Explosive Limit.
PPE Personal Protective Equipment.
ppm Parts per million.

APPENDIX A

PROJECT OVERVIEW

TABLE OF CONTENTS

1.0 PROJECT OVERVIEW

The Site consists primarily of an approximately 32,700-square foot asphalt-paved active pay parking lot located at the southwest corner of East Ohio Street and North Fairbanks Court in Chicago, Illinois. Improvements to the Site include three buildings including a fast food restaurant (Hot Diggity Dog), a vacant metal building, and an attendant's booth for the parking lot attendants.

The Site is located in close proximity to the Lindsay Light Superfund Site and the Lindsay Light II Site where soils containing radioactive thorium have been previously reported. The Lindsay Light Chemical Company is the former maker of incandescent gas mantles for home and street lighting. Based on documentation reviewed by CRA, the Lindsay Light Chemical Company manufactured mantles circa 1910 until 1933 at 161 East Grand Avenue. The process of gas mantle manufacturing involves dipping gauze mantle bags into solutions containing thorium nitrate and small amounts of cerium, beryllium and magnesium nitrates. The principal ingredient in thorium nitrate is radioactive thorium, specifically thorium-232.

The presence of fill material at the Site, which was potentially impacted by the historic operations at the Lindsay Light Superfund Site, was suspected by USEPA. Investigations revealed the presence of above background levels of radiation in certain areas of the Site. The USEPA concluded that none of these areas pose an immediate health hazard; however, the risk for contamination of people and equipment would rise appreciably if the asphalt were removed.

Table 2.1 of the HASP, presents the maximum detected concentration of chemical compounds of concerns in Site soils and groundwater. The exposure routes and regulatory time weighted averages (TWA) exposure levels for the compound of concern are also listed in Table 2.1. These levels are set to protect the health of workers.

1.1 OVERVIEW

The suggested general sequence of activities, are as follows:

- Preparatory work, including obtaining required permits and approvals, and utility clearances;
- Mobilization of materials, equipment and temporary support facilities;
- Site surveying, clearing existing structures and fence removal;

- Removal of asphalt, and walkover survey for presence of impacted soil / fill;
- Sheeting / shoring and excavation, staging and removal of impacted soil / fill to depth;
- Confirmatory soil sampling and analysis;
- Backfilling and Site restoration; and
- Project closeout.

The scope of work includes the following major activities:

i) mobilization and Site control which includes mobilization of equipment and personnel, installation of temporary fencing, the construction of Site facilities, and work zone controls;

ii) Site setup which includes clearing of Site, location and deactivation of Site utilities, removal of existing Site features, and demolition of structures;

iii) removal of asphalt and walkover survey of underlying soil / fill material;

iv) excavation, segregation, temporary stockpiling and testing / sampling of soil / fill material from within the Site area;

v) post-excavation testing / sampling;

vi) material handling and disposal of the following:
   - demolition debris
   - asphalt
   - contaminated soil / fill material
   - uncontaminated soil / fill material (unsuitable for use as backfill)
   - waste water
   - water from excavations
   - general refuse

vii) backfill placement and compaction activities;

viii) decontamination activities; and

ix) demobilization activities.

During a portion of the remediation activities, personnel may come in contact with soil / fill material, water, and waste materials, which potentially contain radioactive or hazardous substances. This section has been developed to ensure the following:

i) that CRA Site personnel are not adversely exposed to the compounds of concern;

ii) that public health and environment are not adversely impacted by materials that are encountered and handled during project activities at the Site;

iii) compliance with applicable governmental and non-governmental (American Conference of Governmental Industrial Hygienists [ACGIH]) regulations and guidelines. In particular, the amended rules of the Occupational Safety and Health Administration (OSHA) for Subpart D of Part 1926 (Title 29 Code of Federal Regulations [CFR] Part 1926.65) will be implemented for Site work where there is a potential to come in contact with hazardous substances and 29 CFR 1910.1096 for radioactive substances; and

iv) initiation of proper emergency response procedures to minimize the potential for any adverse impact to Site workers, the general public, or the environment.

For the purpose of this HASP, activities performed on Site involving contact with material containing potentially hazardous chemicals will be considered a contaminated operation requiring Personal Protective Equipment (PPE) until determination that a lower level of protection is warranted.

Contractors and subcontractors shall develop HASP's specific to their SOW in accordance with the EPA approved Site HASP available at the web address www.epa.gov/Region5/sites/lindsaylight/pdf/lindsaylight_healthplan.PDF. Certain activities at this Site where personnel will not have the potential for contact with contamination and no potential for exposure exists will be exempt from all provisions of the standard (29 CFR 1926.65 or 29 CFR 1910.120), including the medical and training requirements.

All CRA activities at the Site will be conducted in accordance with provisions of this approved Site-specific HASP. A copy of this HASP and any CRA-specific Standard Operating Procedures (SOPs) will be maintained at the Site whenever activities are in progress.

1.2 PROJECT ORGANIZATION

The remedial activities will be undertaken by a remedial contractor, selected by the client group. Oversight of the remedial contractor's activities will be undertaken by CRA. Both the remedial contractor and CRA will enlist subcontractor support, as needed.

The selected remedial contractor will be responsible for providing both a Site Superintendent and a Health and Safety Coordinator (HSC) to direct their activities, and those of their subcontractors. These individuals will be responsible for ensuring that all contract specifications are met, including those related to Site health and safety.

APPENDIX B

SITE CONTROL

TABLE OF CONTENTS

1.0 SITE CONTROL

1.1 AUTHORIZATION TO ENTER

All personnel working in Exclusion Zones (EZs) must have completed hazardous waste operations initial training as defined under OSHA Regulation 29 CFR 1926.65; have completed their initial training or refresher training within the past 12 months, and have been certified by a physician as fit for hazardous waste operations in order to enter a Site area designated as an EZ or Contamination Reduction Zone (CRZ). Personnel without such training or medical certification may enter the designated Support Zone (SZ) only. The HSC will maintain a list of authorized persons; only personnel on the authorized persons list will be allowed within the EZ or CRZ.

1.2 SITE ORIENTATION AND HAZARD BRIEFING

No person will be allowed in the general work area during Site operations without first being given a Site orientation and hazard briefing. This orientation will be presented by the HSC, and will consist of a review of this HASP. This review will cover the radiological, chemical, and physical hazards, protective equipment, safe work procedures, and emergency procedures for the project. Form 5.1 of the HASP provides a SAFETY MEETING REPORT that acts as a training acknowledgment form for documentation purposes. In addition to this meeting, Daily Safety Meetings will be held each day before work begins. All people on the Site, including visitors, must document their attendance to this briefing as well as the Daily Safety Meetings on the forms included with this HASP. Form 5.1 may also serve as the Daily Safety Meeting Log.

1.3 CERTIFICATION DOCUMENTS

Should unanticipated hazardous chemicals be discovered on the Site, training and medical files will be established for the project and kept on Site during all Site operations. The 40-hour training, update, and respirator fit test certificates, as well as current medical clearance for all project field personnel, will be maintained within that file. Site personnel shall provide their training, respirator fit test and medical documentation to the HSC prior to the start of field work.

1.4 ENTRY LOG

A log-in/log-out sheet must be maintained at the Site by the HSC. Personnel may sign in and out on a log sheet as they enter and leave the CRZ, or the HSC may document entry and exit in a field notebook.

1.5 ENTRY REQUIREMENTS

In addition to the authorization, hazard briefing and certification requirements listed above, no person will be allowed to enter the Site unless he or she is wearing the minimum support zone PPE as described in Appendix F. Personnel entering the EZ or CRZ must wear the required PPE for those locations.

1.6 EMERGENCY ENTRY AND EXIT

People who must enter the Site on an emergency basis will be briefed of the hazards by the HSC. All hazardous activities will cease in the event of an emergency and any sources of emissions will be controlled, if possible.

People exiting the Site because of an emergency will gather in a safe area for a head count. The HSC is responsible for ensuring that all people who entered the work area have exited in the event of an emergency.

1.7 CONTAMINATION CONTROL ZONES

Contamination control zones are maintained to prevent the spread of contamination and to prevent unauthorized people from entering hazardous areas.

1.8 EXCLUSION ZONE (EZ)

The EZ consists of the specific work area, or may be the entire area of suspected contamination. All employees entering the EZ must use the required PPE, and must have the appropriate training and medical clearance for hazardous waste work. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. The location of each EZ will be identified by cones, caution tape, or other appropriate means.

1.9 CONTAMINATION REDUCTION ZONE (CRZ)

The CRZ or transition area will be established, if necessary, to perform decontamination of personnel and equipment. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be decontaminated in a specific location. Personal protective outer garments and respiratory protection will be removed in the CRZ and either cleaned or disposed of. This zone is the only appropriate corridor between the EZ and the SZ.

1.10 SUPPORT ZONE (SZ)

The SZ is a clean area outside the CRZ located to prevent employee exposure to hazardous substances. Eating and drinking will be permitted in the support area only after proper decontamination. Smoking only will be permitted in the SZ if the SZ is off Site, and subject to Site requirements.

APPENDIX C

ADDITIONAL EMPLOYEE TRAINING

TABLE OF CONTENTS

1.0 ADDITIONAL EMPLOYEE TRAINING

1.1 GENERAL

Required project personnel must have completed hazardous waste operations-related training, as required by the OSHA Standard 29 CFR 1926.65. Field employees must also receive a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. Personnel who completed their training more than 12 months prior to the start of the project must have completed an 8-hour refresher course within the past 12 months. The Site Superintendent must have completed an additional 8 hours of training for supervisors.

1.2 BASIC 40-HOUR COURSE

The following is a list of the topics typically covered in a 40-hour training course:

i) general safety procedures;

ii) physical hazards (fall protection, noise, heat stress, cold stress);

iii) names and job descriptions of key personnel responsible for Site health and safety;

iv) safety, health, and other hazards typically present at hazardous waste sites;

v) use, application, and limitations of PPE;

vi) work practices by which employees can minimize risks from hazards;

vii) safe use of engineering controls and equipment on site;

viii) medical surveillance requirements;

ix) recognition of symptoms and signs which might indicate overexposure to hazards;

x) worker right-to-know (Hazard Communication OSHA 1926.59/1910.1200);

xi) routes of exposure to contaminants;

xii) engineering controls and safe work practices;

xiii) components of a Site HASP;

xiv) decontamination practices for personnel and equipment;

xv) confined space entry procedures; and

xvi) general emergency response procedures.

1.3 SUPERVISOR COURSE

Management and supervisors receive an additional 8 hours of training which typically includes:

i) general Site safety and health procedures;

ii) PPE programs; and

iii) air monitoring techniques.

1.4 SITE-SPECIFIC TRAINING

Site-specific training will be accomplished by each Site worker reading this HASP, or through a Site briefing by the HSC on the contents of this HASP before work begins. The review must include a discussion of the radiological, chemical, and physical hazards, the protective equipment and safety procedures, and emergency procedures. Form 5.4 provides the Training Acknowledgment Form.

1.5 DAILY SAFETY MEETINGS

Daily Safety Meetings will be held to cover the work to be accomplished, the hazards anticipated, the protective clothing and procedures required to minimize Site hazards and emergency procedures. These meetings should be presented by the Site Superintendent or HSC prior to beginning the day's field work. No work will be performed in an EZ before the daily safety meeting has been held. The daily safety meeting must also be held prior to new tasks, and repeated if new hazards are encountered. Form 5.1 provides the Safety Meeting Report Form for documenting the daily safety meetings.

1.6 FIRST AID AND CPR

At least one employee current in first aid / CPR will be assigned to the work crew and will be on the Site during operations as defined in Section 5.4 of the HASP. Refresher training in first aid and CPR is required. These individuals must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens.

APPENDIX D

BASIC RADIATION SAFETY TRAINING

TABLE OF CONTENTS

1.0 BASIC RADIATION SAFETY TRAINING

1.1 GENERAL

Personnel may be required to complete basic radiation safety training.

Basic Radiation Safety Training Course Outline.

Instructor ______________________________ Date: ____________________________

I. Introduction and Site History
II. What is Radiation?
III. Background Radiation
IV. Types of Radiation
    a. Alpha
    b. Beta
    c. Gama
    d. X-ray
    e. Neutron
V. Units of Radiation
    a. Activity (Ci, Bq)
    b. Exposure (Sv, rad, etc.)
    c. Common Sources of Radiation
VI. ALARA Principles
    a. Time
    b. Distance
    c. Shielding
VII. Biological Effects
    a. Non-stochastic (acute)
    b. Stochastic (chronic)
    c. Teratogenic
VIII. Exposure vs. Contamination (Fixed, Loose, and Airborne)
IX. External and Internal Exposure to Radiation
X. Dose Limits
XI. Safe Work Habits
    a. Exclusion Zones, Postings, and Signs
    b. No Eating, Drinking, or Smoking
    c. Hygiene
    d. Frisking
    e. Dust control
XII. Site Radiation Monitoring
    a. Gamma Surveys
    b. Removable Contamination
    c. Air Monitoring
    d. Personnel Film Badges

XIII. Frisking Procedures
XIV. Site Specific Details and Instructions.

BASIC RADIATION SAFETY TRAINING
ATTENDENCE SHEET

Title: Basic Radiation Safety Training
Date:
Instructor:
Format: Lecture

Print Name	Signature

Instructor's Name (Printed)______________
Instructor's Signature: ________________
Date: ______________________________

APPENDIX E

RADIOLOGICAL HEALTH HANDBOOK – PERSONNEL DECONTAMINATION

APPENDIX E

REPRINTED FROM
RADIOLOGICAL HEALTH HANDBOOK REVISED EDITION
JANUARY 1970
U.S. DEPERTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
PAGES 194 -203
PERSONNEL DECONTAMINATION

PERSONNEL DECONTAMINATION

Method*	Surface	Action	Technique	Advantages
Soap and water	Skin and hands	Emulsifies and dissolves contaminate.	Wash 2-3 minutes and monitor. Do not wash more than 3-4 times.	Readily available and effective for most radioactive contamination.
Soap and water	Hair	Same as above.	Wash several times. If contamination is not lowered to acceptable levels, shave the head and apply skin decontamination methods.	
Lava soap, soft brush, and water	Skin and hands	Emulsifies, dissolves, and erodes.	Use light pressure with heavy-lather. Wash for 2 minutes, 3 times. Rinse and monitor. Use care not to scratch or erode the skin. Apply lanolin or hand cream to prevent chapping.	Same as above.

*Begin with the first listed method and then proceed step by step to the more severe methods, as. Necessary.

AREA AND MATERIAL DECONTAMINATION

Method*	Surface	Action	Technique-	Advantages
Vacuum cleaning	Dry surfaces	Removes contaminated dust by suction.	Use conventional vacuum technique with efficient filter.	Good on dry, porous surfaces. Avoids water reactions.
Water	All nonporous surfaces (metal, painted, plastic, etc.).	Dissolves and erodes.	For large surfaces: Hose with high pressure water at an optimum distance of 15 to 20 feet. Spray vertical surfaces at an angle of incidence of 30° to 40°; work from top to bottom to avoid recontamination. Work upwind to avoid spray. Determine cleaning rate experimentally, if possible; otherwise, use a rate of 4 square feet per minute.	All water equipment may be utilized. Allows operation to be carried out from a distance. Contamination may be reduced by 50%. Water equipment may be used for solutions of other decontaminating agents.
	All surfaces	Dissolves and erodes.	For small surfaces: Blot up liquid and handwipe with water and appropriate commercial detergent.	Extremely effective if done immediately after spill and on nonporous surfaces.
Steam	Nonporous surfaces (especially painted or oiled surfaces).	Dissolves and erodes.	Work from top to bottom and from upwind. Clean surface at a rate of 4 square feet per minute. The cleaning efficiency of steam will be greatly increased by using detergents.	Contamination may be reduced approximately 90% on painted surfaces.
Detergents	Nonporous surfaces (metal, painted, glass, plastic, etc.).	Emulsifies contaminant and increases wetting power of water and cleaning efficiency of steam.	Rub surface 1 minute with a rag moistened with detergent solution then wipe with dry rag; use clean surface of the rag for each application. Use a power rotary brush with pressure feed for more efficient cleaning. Apply solution from a distance with a pressure proportion. Do not allow solution to drip onto other surfaces. Mist application is all that is necessary.	Dissolves industrial film, other materials which hold contamination. Contamination may be reduced by 90%.

*Begin with the first listed method an then proceed step by step to the more severe methods, as necessary.

AREA AND MATERIAL DECONTAMINATION—Continued

Method*	Surface	Action	Technique	Advantages
Complexing agents	Nonporous surfaces (especially unweathered surfaces; i.e., no rust or calcareous growth).	Forms soluble complexes with contaminated material.	Complexing agent solution should contain 3% (by weight) of agent. Spray surface with solution. Keep surface moist 30 minutes by spraying with solution periodically. After 30 minutes, flush material off with water. Complexing agents may be used on vertical and overhead surfaces by adding chemical foam (sodium carbonate or aluminum sulfate).	Holds contamination in solution. Contamination may be reduced by 75% in 4 minutes on unweathered surfaces. Easily stored; carbonates and citrates are nontoxic, noncomrosive.
Organic solvents	Nonporous surfaces (greasy or waxed surfaces, paint or plastic finishes, etc).	Dissolves organic (oil, paint, etc.).	Immerse entire unit in solvent or apply by wiping (see Detergents).	Quick dissolving action. Recovery of solvent possible by distillation.
Inorganic acids	Metal; surfaces (especially with porous deposits. i,e., rust or calcareous growth); circulatory pipe systems.	Dissolves porous deposits.	Use dip-bath procedure for movable items. Acid should be kept at a concentration of 1 to 2 normal (9 to 18% hydrochloric, 3 to 6% sulfuric acid). Leave on weathered surfaces for 1 hour. Flush surface with water, scrub with a water-detergent solution, and rinse. Leave in pipe circulatory system 2 to 4 hours; flush with plain water, a water-detergent solution; then again with plain water.	Corrosive action on metal and porous deposits. Corrosive action may be moderated by addition of corrosion inhibitors to solution.
Acid mixtures: hydrochloric, sulfuric, acetic, citric acids, acetates, citrates	Nonporous surfaces (especially with porous deposits); circulatory pipe systems.	Dissolves porous deposits.	Same as for inorganic acids. A typical mixture consist of 0.1 gallon hydrochloric acid, 0.2 lb. Sodium acetate and 1 gallon water.	Contamination may be reduced by 90% in 1 hour (unweathered surfaces). More easily handled than inorganic acid solution.

*Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

Method*	Surface	Action	Technique	Advantages
Caustics: lye (sodium hydroxide) calcium hydroxide potassium hydroxide	Painted surfaces (horizontal).	Softens paint (harsh method).	Allow paint-remover solution to remain on surface until paint is softened to the point where it may be washed off with water. Remove remaining paint with long-handled scrapers. Typical paint remover solution: 10 gal. Water, 4 lb lye, 6 lb boiler compound, 0.75 lb cornstarch.	Minimum contact with contaminated surfaces. Easily stored.
Trisodium phosphate	Painted surfaces (vertical, over- head).	Softens paint (mild method).	Apply hot 10% solution by rubbing and wiping procedure (see Detergent).	Contamination may be reduced to tolerance in one or two applications.
Abrasion	Nonporous surfaces.	Removes surface.	Use conventional procedures, such as sanding, filing, low and chipping; keep surface damp to a void dust hazard.	Contamination may be reduced to as a level as desired.
Sandblasting	Nonporous surfaces.	Removes surfaces.	Keep sand wet to lessen spread of contamination. Collect used abrasive or flush away with water	Practical for large surface areas.
Vacuum blasting.	Porous and non-porous surfaces	Removes surface; traps and controls contaminated waste.	Hold tool flush to surface to prevent escape of contamination.	Contaminated waste ready for disposal Safest abrasion method.

*Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

APPENDIX F

PERSONAL PROTECTIVE EQUIPMENT

TABLE OF CONTENTS

1.0 PERSONAL PROTECTIVE EQUIPMENT

If unanticipated chemicals are found on the Site, the following PPE are required to safeguard Site personnel from various hazards. Varying levels of protection may be required depending on the level of contaminants and the degree of physical hazard. This section presents the various levels of protection and defines the conditions of use for each level.

1.1 LEVELS OF PROTECTION

Protection levels are determined based upon contaminants present in the work area. The specific protection levels to be employed at the Site are presented in Section 1.2.1. of this Appendix.

1.1.1 LEVEL D PROTECTION

The minimum level of protection that will be required for all Site personnel will be Level D. The following equipment will be used:

i) work clothing as prescribed by the weather;
ii) steel toe work boots (except for liner installation personnel), meeting American National Standard Institute (ANSI) Z41;
iii) safety glasses or goggles, meeting ANSI Z87;
iv) cotton or leather work gloves;
v) high visibility safety vest (as required);
vi) hard hat, meeting ANSI Z89; and
vii) hearing protection (if noise levels exceed 85 dBA, then hearing protection with a U.S.EPA NRR of at least 20 dBA must be used), as specified in Section 4.2.4 of the HASP.

1.1.2 MODIFIED LEVEL D PROTECTION

Modified Level D will be used when airborne contaminants are not present at levels of concern and Site activities present an increased potential for skin contact with hazardous materials. Modified Level D consists of:

i) Tyvek® coveralls;

ii) safety toe work boots;

iii) vinyl or latex boots, or polyvinyl chloride (PVC) overboots;

iv) safety glasses or goggles;

v) hard hat;

vi) face shield in addition to safety glasses or goggles when projectiles and/or splashing liquids pose a hazard;

vii) nitrile gloves;

viii) hearing protection (if necessary); and

ix) high visibility safety vest (as required).

1.1.3 LEVEL C PROTECTION

Level C protection will be worn when on site, real-time instrumentation indicates dusty conditions exceed levels described in the section below labled "Dust / Particulate," as in the section labeled "Organic Vapors," or at the direction of the HSC.

The following equipment will be used for Level C protection:

i) full-face air purifying respirator (APR) with organic vapor/acid gas cartridges in combination with particulate filters (P-100) which are NIOSH approved;

ii) polyethylene coated Tyvek® suit (if liquids/splash hazards are present) or Tyvek® coveralls, ankles, and cuffs taped to boots and gloves;

iii) nitrile gloves over nitrile sample gloves;

iv) safety toe work boots, ANSI approved;

v) chemical resistant neoprene boots with steel toes, or latex/PVC booties over safety toe shoes;

vi) hard hat, ANSI approved;

vii) hearing protection (if necessary); and

viii) high visibility safety vest (as required).

1.1.4 LEVEL B PROTECTION

Level B protection will be worn when airborne concentrations of suspended contaminants are present at sustained levels greater than 25 ppm (if benzene is present) or if carbon monoxide levels exceed 35 ppm. The action level necessitating Level B protection may be revised subject to determination of the compounds triggering the Level B protection requirement.

The following equipment will be used for Level B protection:

i) supplied air respirator (NIOSH approved). Respirators may be positive pressure-demand, self-contained breathing apparatus (SCBA), or positive pressure-demand airline respirator (with 5-minute escape bottle for immediately dangerous to life and health (IDLH) situations);

ii) polyethylene coated Tyvek® or Saranex® coverall with ankles and cuffs taped to boots and gloves;

iii) nitrile gloves over nitrile sample gloves;

iv) safety toe work boots, ANSI approved;

v) chemical resistant neoprene boots with steel toes, or latex/PVC booties over safety toe shoes;

vi) hard hat, ANSI approved;

vii) hearing protection (if necessary); and

viii) high visibility safety vest (as required).

1.1.5 SELECTION OF PPE

Equipment for personal protection will be selected based on the potential for contact, Site conditions, ambient air quality, and the judgement of supervising Site personnel and the HSC. The PPE used will be chosen to be effective against the compound(s) present on the Site.

1.2 RESPIRATORY PROTECTION

Respiratory protection is an integral part of employee health and safety at sites with potential airborne contamination.

1.2.1 SITE RESPIRATORY PROTECTION PROGRAM

The Site respiratory protection program will consist of the following:

i) all Site personnel who may use respiratory protection will have an assigned respirator;

ii) all Site personnel who may use respiratory protection will have been fit tested and trained in the use of a full-facepiece APR within the past 12 months;

iii) all Site personnel who may use respiratory protection must, within the past year, have been medically certified as being capable of wearing a respirator. Documentation of the medical certification must be provided to the HSC prior to commencement of Site work;

iv) only cleaned, maintained, NIOSH approved respirators are to be used on this Site;

v) if respirators are used, the respirator cartridge is to be properly disposed of at the end of each work shift, prior to expected breakthrough or when filter load-up occurs;

vi) contact lenses may be worn as described under section 10.1, bullet 9 of this HASP.

vii) all Site personnel who may use respiratory protection must be clean shaven where the respirator contacts the skin. Mustaches and sideburns are permitted at the discretion of the Site HSC. Permitted facial hair must not interfere with the sealing surface of the respirator;

viii) respirators will be inspected and a negative pressure test performed prior to each use; and

ix) after each use, the respirator will be wiped with a disinfectant, cleansing wipe. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the facepiece.

It is anticipated that excavation activities will be conducted in Level D PPE, with provision to upgrade to Level C, based on action levels listed below.

Radioactive Substances Dust / Particulate

The radioactive contamination on the Site is particulate and insoluble in water. Exposure to radioactive substances will be associated with exposure to airborne dust. A personal aerosol monitor (e.g., MIE® Personal DataRam or equivalent) will also be utilized to determine airborne dust/particulate concentrations. A background reading will be established prior to commencing work activities at each active work area.

Action levels to determine the level of respiratory protection necessary for dust/particulate are based on the concentration of Site contaminants measured within the breathing zone. The action levels and appropriate respiratory protection are as follows:

Sustained Reading Above Background Within Worker Breathing Zone in milligrams per cubic meter (mg/m³):	*Action Taken*
< 5 mg/m^3 or Background	Full-Face Respirator Available
> 5 mg/m^3 and < 50 mg/m^3	Wear Full-Face Respirator
> 50 mg/m^3	Wear Supplied Air Respirator, Implement Additional Engineering Controls

Organic Vapors

A photoionization detector (PID) with a lamp of 10.2 eV or greater will be used to determine if organic vapors are present. A background reading will be established prior to commencing work activities at each active work area.

Action levels to determine the level of respiratory protection necessary for organic vapors are based on the concentration of Site contaminants measured within the breathing zone. The action levels and appropriate respiratory protection are as follows:

Sustained Organic Vapor Reading Above Background Within Worker Breathing Zone in Parts per Million (ppm) with Benzene present in the work zone:	*Action Taken*
< 1.0 ppm or Background	Full-Face Respirator Available
> 1.0 ppm and < 25 ppm	Wear Full-Face Respirator
>25 ppm	Wear Supplied Air Respirator, Implement Additional Engineering Controls

Sustained Organic Vapor Reading Above Background Within Worker Breathing Zone in Parts per Million (ppm) without Benzene present in the work zone:	***Action Taken***
< 10 ppm or Background	Full-Face Respirator Available
> 10 ppm and < 250 ppm	Wear Full-Face Respirator
> 250 ppm	Wear Supplied Air Respirator, Implement Additional Engineering Controls

These action levels have been set based on the presence of BETX as the main contaminants of concern. However, if the ambient concentrations of organic vapors are due to unidentifiable/unknown substances, the level of respiratory protection may be altered by the HSC.

1.3 USING PPE

Depending upon the level of protection selected for this project, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory if Level B or Level C PPE is used.

All personnel entering the EZ must put on the required PPE in accordance with the requirements of this plan. When leaving the EZ, PPE will be removed in accordance with the procedures listed, to minimize the spread of contamination.

1.3.1 DONNING PROCEDURES

These procedures are mandatory only if Level B or Level C PPE is used on the project:

i) remove bulky outerwear. Remove street clothes and store in clean location;

ii) put on work clothes or coveralls;

iii) put on the required chemical protective coveralls or rain gear;

iv) put on the required chemical protective boots or boot covers;

v) tape the legs of the coveralls to the boots with duct tape;

vi) put on the required chemical protective gloves;

vi) tape the wrists of the protective coveralls to the gloves;

vii) don the required respirator and perform appropriate fit check;

viii) put hood or head covering over head and respirator straps and tape hood to facepiece; and

ix) don remaining PPE, such as hard hat.

When these procedures are instituted, one person must remain outside the work area to ensure that each person entering has the proper protective equipment.

1.3.2 DOFFING PROCEDURES

The following procedures are only mandatory if Level B or C PPE is required for this project. Whenever a person leaves a Level B or C work-site, the following decontamination sequence will be followed:

i) upon entering the CRZ, rinse contaminated materials from the boots or remove contaminated boot covers;

ii) clean reusable protective equipment;

iii) remove protective garments, equipment, and respirator. All disposable clothing should be placed in a covered container which is labeled;

iv) wash hands, face, and neck or shower (if necessary);

v) proceed to clean area and dress in clean clothing; and

vi) clean and disinfect respirator for next use.

All disposable equipment, garments, and PPE must be placed in covered containers and labeled for disposal. See Section 10.0 for detailed information on decontamination procedures.

1.4 SELECTION MATRIX

The level of personal protection selected will be based upon real-time air monitoring of the work environment and an assessment by the Site Superintendent and HSC of the potential for skin contact with contaminated materials.

1.5 DURATION OF WORK TASKS

The duration of activities involving the usage of PPE will be established by the HSC based upon ambient temperature and weather conditions, the capacity of personnel to work in the designated level of PPE (heat stress, see Section 8.0 of the HASP) and limitations of the protective equipment (i.e., ensemble permeation rates, life expectancy of APR cartridges, etc.). As a minimum, rest breaks will be observed at the following intervals:

i) 15 minutes midway between shift startup and lunch;

ii) 1/2 to 1 hour for lunch; and

iii) 15 minutes in the afternoon, between lunch and shift end.

All rest breaks will be taken in a clean area (e.g., SZ) after full decontamination and PPE removal. Additional rest breaks will be observed, based upon the heat stress monitoring guidelines presented in Section 8.0 of the HASP.

1.6 LIMITATIONS OF PROTECTIVE CLOTHING

PPE ensembles have been selected to provide protection against contaminants at anticipated concentrations. However, no protective garment, glove, or boot is chemical-proof, nor will it afford protection against all chemical types. Permeation of a given chemical through PPE is a complex process governed by contaminant concentrations, environmental conditions, physical condition of the protection garment, and the resistance of a garment to a specific contaminant; chemical permeation may continue even after the source of contamination has been removed from the garment.

In order to obtain optimum usage from PPE, the following procedures are to be followed by all Site personnel using PPE:

i) when using disposable coveralls, don a clean, new garment after each rest break or at the beginning of each shift;

ii) inspect all clothing, gloves, and boots both prior to and during use for:
   a) imperfect seams,
   b) non-uniform coatings,
   c) tears, and
   d) poorly functioning closures; and

iii) inspect reusable garments, boots, and gloves both prior to and during use for:

   a) visible signs of chemical permeation,
   b) swelling,
   c) softening,
   d) discoloration,
   e) stiffness,
   f) brittleness,
   g) cracks,
   h) any sign of puncture, and
   i) any sign of abrasion.

Reusable gloves, boots, or coveralls exhibiting any of the characteristics listed above will be discarded. PPE used in areas known or suspected to exhibit elevated concentrations of contaminants will not be reused.

APPENDIX G

PERSONNEL EXPOSURE AND AIR MONITORING PROGRAM

TABLE OF CONTENTS

1.0 PERSONNEL EXPOSURE AND AIR MONITORING PROGRAM

This section of the HASP presents the requirements for conducting personnel exposure and air monitoring at the Site. The program is designed to ensure protection for both personnel working on Site and the surrounding community. The on-Site monitoring program will be conducted by the remedial contractor and will consist of monitoring Site personnel exposures to radiation, VOCs, and dust/particulate. In addition, monitoring will be conducted for oxygen and combustible gas levels. This monitoring will be completed with the use of both real-time reading instruments and dosimeter testing techniques.

A Community Air Monitoring Program (CAMP) will be implemented and maintained by the RSSI and will consist of real-time Site air monitoring around the Site perimeter.

1.1 ON-SITE AIR MONITORING

In addition to the radiologic concerns discussed in RSSI's Radilogical HASP (Appendix M), the HSC or Environmental Monitoring Technician will perform air monitoring to evaluate the exposure of Site personnel to chemical and physical hazards, verify the effectiveness of engineering controls, and determine the proper level of PPE. During the progress of excavation activities, the HSC will monitor the levels of VOCs, oxygen and combustible gases, and particulate levels on an hourly basis or more frequently as necessary. The following monitoring equipment will be used for this purpose:

i) a PID equipped with at least 10.2 eV lamp;

ii) a four gas meter capable of measuring oxygen levels / combustible gas / carbon monoxide / hydrogen sulfide;

iii) a multigas personal alarm meter (e.g., MSA Passport® Five Star Personal Alarm of equivalent);

iv) personal aerosol monitor (e.g., MIE® Personal DataRam or equivalent); and

v) colorimetric detector tubes to determine the presence of benzene (as required).

All instruments will be calibrated on a daily basis in accordance with the manufacturer's guidelines. Records of all calibrations and real-time measurements will be kept in a bound field log book.

1.1.1 REAL-TIME VOC MONITORING

The HSC will continuously monitor for the presence of VOCs. PID readings will be taken in and around all EZs. Action levels for upgrading or downgrading of PPE have been established by the U.S.EPA for atmospheres containing unknown concentrations of VOCs. Table 9.1 presents the action levels for the on-Site Air Monitoring Program.

1.1.2 COMBUSTIBLE GAS, OXYGEN, HYDROGEN SULFIDE, CARBON MONOXIDE

Air monitoring for combustible gases and oxygen will be conducted during excavation, activities, and during other activities where oxygen deficient and/or flammable atmospheres may be encountered (e.g. confined spaces; entry into excavations). The point of excavation and the immediate work area around these activities must be monitored to ensure that an adequate level of oxygen is present, and to determine if a flammable atmosphere exists. Combustible gas and oxygen level monitoring will be conducted as needed in areas that are suspect. The HSC will determine the monitoring frequency based on the observed Site conditions. All work activity must stop where monitoring indicates the flammable vapors concentration is 10 percent of the lower explosive limit (LEL) at a location with a potential ignition source. Such an area must be ventilated to reduce the concentration to an acceptable level.

In addition to combustible gas and oxygen, monitoring for hydrogen sulfide and carbon monoxide will be conducted during all confined space entry activities, including excavation entry.

Action levels for combustible gases, oxygen, hydrogen sulfide and carbon monoxide are presented in Table 9.1.

1.1.3 PERSONAL AIR MONITORING

HSC or designee will also implement a personnel air monitoring program for those employees who have the highest risk of potential for exposure to chemicals present on Site. This monitoring will be done in compliance with 1926.65(h) and in accordance with OSHA's standards for lead (1926.62) and benzene (1926.1128). HSC or designee may select additional chemical compounds to be monitored based upon Site VOC measurements and Site conditions throughout the project. Samples will be collected during startup of the excavation activities, where personnel would face potential exposure, for the purpose of verifying the adequacy of personal protection and to document the actual exposure level to the selected chemical compound. The number and frequency of sampling events will be determined by the HSC. Appropriate NIOSH methodology will be followed and all samples are to be sent to an American Industrial Hygiene Association (AIHA) accredited laboratory. Results for all personnel air sampling will be posted for all project personnel to review.

1.2 COMMUNITY AIR MONITORING PROGRAM (CAMP)

Air monitoring will be conducted during performance of the remedial activities to ensure that the community will not be adversely impacted during Site activities. The CAMP will be implemented and maintained by RSSI. Site personnel should contact the RSSI directly for more detailed information about the CAMP.

1.3 DECONTAMINATION PROCEDURES

In general, everything that enters the EZ at this Site must either be decontaminated or properly discarded upon exit from the EZ. All personnel, including any State and local officials must enter and exit the EZ through the CRZ. Prior to demobilization, potentially contaminated equipment will be decontaminated on a wash pad (decontamination pad) which has a built in sump and the equipment will be inspected by the HSC before it is moved into the clean zone. Any material that is generated by decontamination procedures will be stored in a designated area in the EZ until disposal arrangements are made.

The type of decontamination solution to be used is dependent on the type of chemical hazards. The decontamination solution for heavy equipment and for any reusable PPE is Liqui-nox soap. The Material Safety Data Sheets (MSDSs) for Liqui-nox and any other chemical containing products brought to the Site will be maintained on Site by the HSC.

1.4 EQUIPMENT DECONTAMINATION PROCEDURES

All equipment that comes in contact with waste material must be decontaminated within the CRZ by a pressure water cleaner upon exit from the EZ. Decontamination procedures should include: knocking soil/mud from machines; water brush scrubbing using a solution of water and Liqui-nox; and a final water rinse. Personnel shall wear Level C or Modified Level D protection, as determined by the HSC, when decontaminating equipment. Runoff and sediments will be collected and stored until proper disposal arrangements have been made. Following decontamination and prior to exit from the EZ, the HSC shall be responsible for ensuring that the item has been sufficiently decontaminated. This inspection shall be included in the Site log.

1.5 PERSONNEL DECONTAMINATION PROCEDURES

Personnel decontamination will be completed in accordance with the personnel decontamination procedures detailed in Appendix I. The general guidelines for a typical Level C decontamination line are described below:

i) upon entering the CRZ, rinse contaminated materials from boots or remove contaminated boot covers;

ii) clean reusable protective equipment;

iii) remove protective garments, equipment, and respirator. All disposable clothing should be placed in a covered container which is labeled;

iv) wash hands, face, and neck or shower (if necessary);

v) proceed to clean area and dress in clean clothing; and

vi) clean and disinfect respirator for next use.

1.6 MEDICAL SURVEILLANCE

In accordance with the requirements detailed in 29 CFR 1926.65 and 29 CFR 1910.134, all Site personnel who will come in contact with potentially contaminated materials will have received, within one year prior to starting field activities, medical surveillance by a licensed physician or physician's group. If it is documented that personnel at the Site are exposed to levels of lead above its action level of 30 $\mu g/m^3$, then personnel who work in the EZ will require additional medical surveillance in accordance with 29 CFR 1926.62(j). This medical monitoring will include blood sampling and analysis for lead and zinc protoporphyrin as required in OSHA's lead standard, 29 CFR 1926.62.

Medical records for all on-Site personnel will be maintained by their respective employers. The medical records will detail the tests that were taken and will include a copy of the consulting physician's statement regarding the tests and the employee's suitability for work.

The medical records will be available to the employee or his designated representative upon written request, as outlined in 29 CFR 1910.1020.

Each employer will provide certifications to their on-Site HSC that their personnel involved in Site activities will have all necessary medical examinations prior to commencing work which requires respiratory protection or potential exposure to hazardous materials. Personnel not obtaining medical certification will not perform work within contaminated areas.

Interim medical surveillance will be completed if an individual exhibits poor health or high stress responses due to any Site activity or when accidental exposure to elevated concentrations of contaminants occur.

1.7 EMERGENCY CONTINGENCIES

It is essential that Site personnel be prepared in the event of an emergency. Emergencies can take many forms; illnesses or injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather. The following sections outline the general procedures for emergencies. Emergency information should be posted as appropriate. Radios will be provided for contact purposes. All emergencies will be reported to the appropriate emergency responders. They may give the selected contractor and/or the subcontractor further direction as to the responsibilities during any emergency situation. In general, selected contractor and subcontractor personnel will shut down equipment and evacuate to a safe pre-determined meeting area during Site emergencies.

Communication between work areas and the command post, located within the CZ, will be via verbal communication, auto horn, or two-way radio. The HSC will use the nearest telephone on Site or may be in the possession of a mobile telephone to communicate with outside emergency and medical facilities.

The following signals shall be established for use with auto or compressed air-type horns:

i) 3 Blasts: evacuate exclusion area through Gate(s) and muster at designated muster points determined by the HSC.

ii) An "All Clear" will be conveyed by radio communication.

The following hand signals will be used by downrange field teams in conjunction with the "buddy" system. These signals are very important when working with heavy equipment. They shall be known by the entire field team before operations commence.

	Signal	*Meaning*
•	Hand Gripping Throat	Out of Air; Can't Breathe
•	Grip Partner's Wrist	Leave Area Immediately
•	Hands on Top of Head	Need Assistance
•	Thumbs Up	Ok, I'm All Right, I Understand
•	Thumbs Down	No, Negative

1.8 EMERGENCY AND FIRST AID EQUIPMENT

Emergency safety equipment will be available for use by Site personnel and will be located and maintained on Site. The safety equipment will include, but is not limited to, the following:

i) portable emergency eye wash and drench shower (pressurized);

ii) two 20-pound ABC type dry chemical fire extinguishers;

iii) approved first-aid kit for a minimum of twenty personnel;

iv) fire blanket;

v) two SCBA units; and

vi) portable air horn.

1.9 PROJECT PERSONNEL RESPONSIBILITIES DURING EMERGENCIES

1.9.1 HEALTH AND SAFETY COORDINATOR (HSC)

As the administrator of the HASP, the HSC has primary responsibility for responding to and correcting emergency situations. The HSC will:

i) take appropriate measures to protect personnel including: posting of acceptable Site evacuation routes , withdrawal from the EZ, total evacuation and securing of the Site or upgrading or downgrading the level of protective clothing and respiratory protection;

ii) take appropriate measures to protect the public and the environment including isolating and securing the Site, preventing runoff to surface waters, and ending or controlling the emergency to the extent possible;

iii) ensure that appropriate Federal, State, and local agencies are informed, and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. In the event of an air release of toxic materials, the local authorities should be informed in order to assess the need for evacuation. In the event of a spill, sanitary districts and drinking water systems may need to be alerted;

iv) ensure that appropriate decontamination treatment or testing for exposed or injured personnel is obtained;

v) determine the cause of the incident and make recommendations to prevent the reoccurrence; and

vi) ensure that all required reports have been prepared.

1.10 MEDICAL EMERGENCIES

Any person who becomes ill or injured in the EZ must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed as much as possible without causing further harm to the patient. First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the HSC, Site Superintendent, and Resident Engineer.

Any person transporting an injured/exposed person to a clinic or hospital for treatment should take with them directions to the hospital and a copy of the identified chemicals on Site to which they may have been exposed.

Any vehicle used to transport contaminated personnel, will be cleaned or decontaminated as necessary.

1.11 FIRE OR EXPLOSION

In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival, the HSC or designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials on Site.

If it is safe to do so, Site personnel should:

i) report to the Resident Engineer;

ii) use fire fighting equipment available on Site; or

iii) remove or isolate flammable or other hazardous materials which may contribute to the fire.

1.12 SPILL OF HAZARDOUS MATERIALS

On Site:

If a spill occurs, the following procedure will be followed:

i) notify the HSC, Site Superintendent, and Resident Engineer;

ii) evacuate immediate area of spill;

iii) determine the needed level of PPE;

iv) don required level of PPE and prepare to make entry to apply spill containment and control procedures;

v) no entry will be made until atmosphere is less than 20 percent of the LEL; and

vi) absorb or otherwise clean up the spill and containerize the material, sorbent, and affected soils.

The Site Superintendent has the authority to commit resources as needed to contain and control released material and to prevent its spread to off-Site areas.

Releases from drums containing solid wastes will be placed into approved containers and covered. Each container will be labeled as to its contents. Solid spills from haulage units will be placed back into haulage units.

In the event that a drum or container of liquid is spilled on Site outside of the EZ, a drum handling team will immediately respond to the spill. The spilled liquids will be confined to the immediate area of the spill and the liquids will be pumped, with the use of a portable hand pump, into a repack drum. The spilled liquids will be confined by diking around the spill with native material or with an inert absorbent. Any residual liquids which cannot be pumped will be absorbed with a sufficient quantity of inert absorbent to ensure that no free liquids remain. If the spill occurred on soil, the visibly affected soil will be excavated to limits based on a visual determination of spill contamination with the concurrence of the on-Site Client Representative. The absorbent and excavated material will be drummed or otherwise appropriately contained.

2.0 RECORDKEEPING

The HSC shall establish and maintain records of all necessary and prudent monitoring activities as described below:

i) name and job classification of the employees involved on specific tasks;

ii) records of fit testing and medical surveillance results for Site personnel;

iii) records of all OSHA training certification for Site personnel;

iv) records of training acknowledgment forms and daily safety meetings;

v) emergency report sheets describing any incidents or accidents; and

vi) air / radiological monitoring equipment calibrations.

APPENDIX H

ACTIVITY HAZARD/RISK ANALYSIS AND GENERAL SAFETY PRACTICES

<u>TABLE OF CONTENTS</u>

1.0 ACTIVITY HAZARD/RISK ANALYSIS AND GENERAL SAFETY PRACTICES

This section identifies the general hazards associated with specific remedial activities and presents the documented or potential health and safety hazards that exist at the Site. Every effort will be made to reduce or eliminate these hazards. Those which cannot be eliminated must be guarded against by use of engineering controls and/or PPE.

In addition to the radiological and chemical hazards presented in this HASP, physical hazards including hazards presented by the use of heavy equipment, overhead and underground utility hazards,–uneven terrain, slippery surfaces, and the use of decontamination equipment, exist at the Site. It will be the responsibility of the HSC and Site personnel to identify the physical hazards posed by the various Site remedial activities and implement preventative and corrective action.

Potential for heat and cold stress and confined spaces and excavations are previously discussed in Sections 4.2.1, 4.2.2, and 13.0 of this HASP.

1.1 CHEMICAL EXPOSURE

Chemical substances can enter the unprotected body by inhalation, skin absorption, ingestion, or through a puncture wound (injection). A contaminant can cause damage at the point of contact or can act systematically, causing a toxic effect at a part of the body distant from the point of initial contact. The chemical contaminants of concern at the Site are outlined in Table 2.1.

Chemical exposures are generally divided into two categories: acute and chronic. Symptoms resulting from acute exposures usually occur during or shortly after exposure to a sufficiently high concentration of a contaminant. The concentration required to produce such effects varies widely from chemical to chemical. The term "chronic exposure" generally refers to exposures to "low" concentrations of a contaminant over a long period of time. The "low" concentrations required to produce symptoms of chronic exposure depend upon the chemical, the duration of each exposure, and the number of exposures. For a given contaminant, the symptoms of an acute exposure may be completely different from those resulting from chronic exposure.

For either chronic or acute exposure, the toxic effect may be temporary and reversible, or may be permanent (disability or death). Some chemicals may cause obvious symptoms such as burning, coughing, nausea, tearing eyes, or rashes. Other chemicals may cause health damage without any such warning signs (this is a particular concern for chronic exposures to low concentrations). Health effects such as cancer or respiratory disease may not become evident for several years or decades after exposure. In addition, some toxic chemicals may be colorless and/or odorless, may dull the sense of smell, or may not produce any immediate or obvious physiological sensations. Thus, a worker's senses or feelings cannot be relied upon in all cases to warn of potential toxic exposure.

The effects of exposure not only depend on the chemical, its concentration, route of entry, and duration of exposure, but may also be influenced by personal factors such as the individual's smoking habits, alcohol consumption, medication use, nutrition, age, and sex.

An important exposure route of concern at the Site is inhalation. The lungs are extremely vulnerable to chemical agents. Even substances that do not directly affect the lungs may pass through lung tissue into the bloodstream, where they are transported to other vulnerable areas of the body. Some toxic chemicals present in the atmosphere may not be detected by human senses (i.e., they may be colorless, odorless, and their toxic effects may not produce any immediate symptoms). Respiratory protection is therefore extremely important if there is a possibility that the work-site atmosphere may contain such hazardous substances. Chemicals can also enter the respiratory tract through punctured eardrums. Where this is a hazard, individuals with punctured eardrums should be medically evaluated specifically to determine if such a condition would place them at an unacceptable risk and preclude their working at the task in question.

Direct contact of the skin and eyes by hazardous substances is another important route of exposure. Some chemicals directly injure the skin. Some pass through the skin into the bloodstream where they are transported to vulnerable organs. Skin absorption is enhanced by abrasions, cuts, heat, and moisture. The eye is particularly vulnerable because airborne chemicals can dissolve in its moist surface and be carried to the rest of the body through the bloodstream (capillaries are very close to the surface of the eye). Wearing protective equipment, not using contact lenses in contaminated atmospheres (since they may trap chemicals against the eye surface), keeping hands away from the face, and minimizing contact with liquid and solid chemicals can help protect against skin and eye contact.

Although ingestion should be the least significant route of exposure at the Site, it is important to be aware of how this type of exposure can occur. Deliberate ingestion of chemicals is unlikely, however, personal habits such as chewing gum or tobacco, drinking, eating, smoking cigarettes, and applying cosmetics at the Site may provide a route of entry for chemicals.

The last primary route of chemical exposure is injection, whereby chemicals are introduced into the body through puncture wounds (i.e., by stepping or tripping and falling onto contaminated sharp objects). Wearing safety shoes, avoiding physical hazards, and taking common sense precautions are important protective measures against injection.

1.2 GENERAL PRACTICES

Additional general safety practices to be implemented are as follows:

i) at least one copy of this HASP must be at the project Site, in a location readily available to all personnel, and reviewed by all project personnel prior to starting work;

ii) all Site personnel must use the buddy system (working in pairs or teams);

iii) food, beverages, or tobacco products must not be present or consumed in the EZ and CRZ. Cosmetics must not be applied within these zones;

iv) emergency equipment such as eyewash, fire extinguishers, etc., must be removed from storage areas and staged in readily accessible locations;

v) contaminated waste, debris, and clothing must be properly contained and legible and understandable precautionary labels must be affixed to the containers;

vi) removing contaminated soil from protective clothing or equipment with compressed air, shaking, or any other means that disperses contaminants into the air is prohibited;

vii) containers must be moved only with the proper equipment, and must be secured to prevent dropping or loss of control during transport; and

viii) visitors to the Site must be instructed to stay outside the EZ and CRZ and remain within the SZ during the extent of their stay. Visitors must be cautioned to avoid skin contact with surfaces that are contaminated or suspected to be contaminated.

1.2.1 BUDDY SYSTEM

All on-Site personnel must use the buddy system. Visual contact must be maintained between crew members at all times, and crew members must observe each other for signs of hazardous chemical exposure, heat, or cold stress. Indications of adverse effects include, but are not limited to:

i) changes in complexion and skin coloration;

ii) changes in coordination;

iii) excessive salivation and pupillary response; and

iv) changes in speech pattern.

Team members must also be aware of potential exposure to possible safety hazards, unsafe acts, or noncompliance with safety procedures. Employees must inform their partners or fellow team members of non-visible effects of exposure to hazardous materials. The symptoms of such exposure may include:

i) headaches;

ii) dizziness;

iii) nausea;

iv) blurred vision;

v) cramps; and

vi) irritation of eyes, skin, or respiratory tract.

If protective equipment or noise levels impair communications, prearranged hand signals must be used for communication. Personnel must stay within line of sight of another team member.

1.3 HEAT STRESS

Refer to Section 4.2.1 in the HASP.

1.4 COLD STRESS

Refer to Section 4.2.2 in the HASP.

1.5 EXCAVATION

Site activities will involve extensive excavation of soil / fill material. The Remedial Contractor will be responsible for developing and implementing procedures related to excavation and handling of these materials.

Excavation and trenching operations require pre-planning to determine whether sloping or shoring systems are required, and to develop appropriate designs for such systems.

Also, the estimated location of all underground installations must be determined before digging begins.

If there are any nearby buildings, walls, sidewalks, trees, or roads that may be threatened or undermined by the excavation, where the stability of any of these items may be endangered by the excavation, they must be removed or supported by adequate shoring, bracing, or underpinning.

Excavations may not go below the base of footings, foundations, or retaining walls, unless they are adequately supported or a person who is registered as a Professional Engineer (PE) has determined that they will not be affected by the soil removal. OSHA recommends that civil engineers or those with licenses in a related discipline and experience in the design and use of slopping and shoring systems be engaged. PE qualifications must be documented in writing.

Personnel required to enter or work in the excavation at any time must be protected from the hazards of cave-ins. This requires the use of sloping and/or shoring systems that comply with State and Federal OSHA standards.

Attachment A - Excavation and Trenching will be followed during all excavation activities and provides detailed information regarding such activities.

1.6 CONFINED SPACES

Refer to Section 13.0 of the HASP.

1.7 FALL HAZARDS

Site personnel may be exposed to fall hazards greater than six feet above another surface and where there are no barriers in place to protect them. These hazards may be found in the following activities: working from elevated surfaces, near excavations, or on equipment, etc.

It is the responsibility of the HSC to implement the following components of the Site Fall Protection Program.

i) Ensure appropriate fall protection systems are utilized for project activities;

ii) Verify that all employees are fully protected from fall hazards;

iii) Necessary materials for proper fall protection (PPE, etc.) are available for project activities;

iv) Provide for proper inspection and replacement of fall protection devices; and

v) Provide and ensure that all personnel have received the required training in the use, inspection and the need for fall protection devices (proper fit, proper use, and proper inspection procedures).

1.8 BIOLOGICAL HAZARDS

There are no known or suspected biological hazards at the Site. If any are identified during the progress of the work then amendments to the HASP will be made.

1.9 NOISE

General requirements regarding noise exposure at the Site are covered under Section 4.2.4 of the HASP.

1.10 SANITATION

Site sanitation will be maintained according to OSHA and Department of Health requirements.

1.10.1 BREAK AREA

Breaks must be taken in the SZ, away from the active work area after Site personnel go through decontamination procedures. There will be no smoking, eating, drinking, or chewing gum or tobacco in the area other than the SZ.

1.10.2 POTABLE WATER

Refer to Section 11.0 of the HASP.

1.10.3 SANITARY FACILITIES

Access to facilities for washing before eating, drinking, or smoking will be provided. Showering facilities will also be provided at the Site (if necessary).

1.10.4 LAVATORY

If permanent toilet facilities are not available, an adequate number of portable chemical toilets will be provided.

1.10.5 TRASH COLLECTION

Trash collected from the CRZ will be separated as potentially contaminated waste. Trash collected in the support and break areas will be disposed of as non-hazardous waste. Trash receptacles will be set up in the CRZ and in the SZ.

1.11 ELECTRICAL HAZARDS

Refer to Section 14.1 of the HASP.

1.12 LIFTING HAZARDS

Back strain or injury may be prevented by using proper lifting techniques. The fundamentals of proper lifting include:

i) consider the size, shape, and weight of the object to be lifted. A mechanical lifting device or additional persons must be used to lift an object if it cannot be lifted safely alone;

ii) the hands and the object should be free of dirt or grease that could prevent a firm grip;

iii) gloves must be used, and the object inspected for metal slivers, jagged edges, burrs, or rough or slippery surfaces;

iv) fingers must be kept away from points which could crush or pinch them, especially when putting an object down;

v) feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear;

vi) the load should be kept as low as possible, close to the body with the knees bent;

vii) to lift the load, grip firmly and lift with the legs, keeping the back as straight as possible;

viii) a worker should not carry a load that he or she cannot see around or over; and

ix) when putting an object down, the stance and position are identical to that for lifting; the legs are bent at the knees, and the back is straight as the object is lowered.

APPENDIX I

PERSONNEL DECONTAMINATION PROCEDURES

TABLE OF CONTENTS

Page

1.0 DECONTAMINATION

1.1 SCOPE

Personal protective equipment (PPE) and monitoring equipment must either be decontaminated or properly discarded upon exiting from the exclusion zone. This practice prevents cross-contamination to clean areas. All Site personnel must enter and exit the exclusion zone through the contaminant reduction zone and decontamination area. The configuration of these zones will vary from site to site and will be defined in the site-specific HASP.

2.0 DECONTAMINATION METHODS

Decontamination methods shall involve physically removing contaminants, neutralizing contaminants, or removing contaminants through a combination of both physical and chemical means. The types, locations, physical states, and concentrations of contamination present will determine the appropriate method of decontamination.

2.1 PROCEDURES

This Standard Operating Procedure (SOP) contains personnel decontamination procedures for Levels A, B, C, and D. The site Health and Safety Officer is responsible to monitor these procedures and may modify them to suit the site conditions and specific levels in use. General standard operating procedures to be followed are:

- minimize contact with contaminants in order to minimize the need for extensive decontamination;
- gloves, boot covers, and disposable outer clothing shall be rolled down with the insides out;
- sampling/monitoring equipment, when feasible, shall be enclosed in plastic bags to prevent cross-contamination; and
- decontamination solutions of soap and water or trisodium phosphate (TSP) detergent and water shall be used as a minimum requirement.

2.2 EQUIPMENT DECONTAMINATION

Monitoring equipment will be decontaminated before leaving the site by wiping with a damp cloth or by removing and properly disposing of a protective covering. Construction equipment will typically be manually scraped then steam cleaned. The HSO is responsible to verify that this has been done satisfactorily.

3.0 WASTE DISPOSAL

CRA project management will determine a disposal method based on an approval plan for each specific site.

3.1 MANAGEMENT AND DISPOSAL OF DECONTAMINATION SOLUTIONS

Decontamination solutions must be treated or properly disposed of. In determining if a particular management disposal option is appropriate, the following should be considered:

- the contaminants, their concentrations, and the total volume of decontamination solution;
- media potentially affected (e.g., groundwater, soil) under management options;
- location of the nearest population(s) and the likelihood and/or degree of site access;
- potential exposure to workers; and
- potential for environmental impacts.

All wastes belong to clients and are to be left on site. CRA will notify the client what has been left on site and offer to help in arranging proper disposal/treatment.

4.0 SHOWERS AND CHANGE ROOMS

Showers and/or change rooms may be provided for Site personnel when the duration of project activities extends for a long period of time or will be provided when site conditions warrant the need for a separate change area. Showering requirements vary from site to site and are defined in the site-specific HASP based on site-specific conditions.

5.0 DECONTAMINATION LEVELS

5.1 LEVEL A - ROUTINE DECONTAMINATION

Step 1 - Segregated Equipment Drop

- Deposit equipment used on site (tools, sampling devices and containers, monitoring equipment, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross-contamination.

Step 2 - Boot Cover and Glove Wash

- Scrub outer boot covers and gloves with decontamination solution or detergent/water.

Step 3 - Boot Cover and Glove Rinse

- Rinse off decontamination solution from Step 2 using copious amounts of water.
- Repeat as many times as necessary.

Step 4 - Tape Removal

- Remove tape around boots and gloves and deposit in container with plastic liner.

Step 5 - Boot Cover Removal

- Remove boot covers and deposit in container with plastic liner.

Step 6 - Outer Glove Removal

- Remove outer gloves and deposit in container with plastic liner.

Step 7 - Suit/Safety Boot Wash

- Thoroughly wash fully encapsulating suit and boots. Scrub suit and boots with long-handle, soft-bristle scrub brush, and copious amounts of decontamination solution or detergent/water. Repeat as many times as necessary.

Step 8 - Suit/Safety Boot Rinse

- Rinse off decontamination solution or detergent/water using copious amounts of water. Repeat as many times as necessary.

Step 9 - Tank Change

- If worker leaves the exclusion zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers donned, and joints taped. Worker then returns to duty.

Step 10 - Safety Boot Removal

- Remove safety boots and deposit in container with plastic liner.

Step 11 - Fully Encapsulating Suit and Hard Hat Removal

- With assistance of helper, remove fully encapsulating suit (and hard hat). Hang suits on rack or lay out on drop cloths.

Step 12 - SCBA Backpack Removal

- While still wearing facepiece, remove backpack and place on table. Disconnect hose from regulator valve and proceed to next step.

Step 13 - Inner Glove Wash

- Wash with decontamination solution or detergent/water that will not harm skin. Repeat as many times as necessary.

Step 14 - Inner Glove Rinse

- Rinse with water. Repeat as many times as necessary.

Step 15 - Facepiece Removal

- Remove facepiece. Deposit in container with plastic liner. Avoid touching face with fingers.

Step 16 - Inner Glove Removal

- Remove inner gloves and deposit in container with plastic liner.

Step 17 - Inner Clothing Removal

- Remove clothing soaked with perspiration. Place in container with plastic liner. Inner clothing should be removed as soon as possible since there is a possibility that small amounts of contaminants might have been transferred in removing fully encapsulating suit.

Step 18 - Field Wash

- Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.

Step 19 - Redress

- Put on clean clothes. A dressing trailer is needed in inclement weather.

5.2 LEVEL B - ROUTINE DECONTAMINATION

Step 1 - Equipment Drop

- Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths.
- Decontaminate or dispose of items before removal from the exclusion zone.

Step 2 - Outer Boot/Glove Wash and Rinse

- Scrub outer boots/gloves with decontamination solution.
- Rinse using water.

Step 3 - Outer Boot/Glove Removal

- Remove outer boots/gloves.
- If outer boots/gloves are disposable, deposit in container with plastic liner.
- If outer boots/gloves are non-disposable, store in a clean, dry location.

Step 4 - Outer Garment Removal

- If using self-contained breathing apparatus (SCBA), remove SCBA backpack and keep the facepiece on until garments are removed. Remove chemical protective outer garments and deposit in appropriate container.

Step 5 - Respiratory Protection Removal

- Remove hard hat and face piece, and place them on a clean surface.
- Wash and rinse face piece.
- Wipe off and store face piece in a clean, dry location.

Step 6 - Inner Glove Removal

- Remove inner gloves.
- Deposit in container for disposal.

Step 7 - Field Wash

- Thoroughly wash hands and face with soap and water.
- Shower as soon as possible.

For Air Tank Exchange Only, Complete the Following Steps:

Step 1 - Equipment Drop

- Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths.
- Decontaminate or dispose of items before removal from the exclusion zone.

Step 2 - Glove Removal

- Remove gloves.
- If gloves are disposable, deposit in container with plastic liner
- If gloves are non-disposable, store in a clean, dry location.

Step 3 - Tank Change

- Exchange air tank.
- Don new gloves.
- Tape joints and return to the exclusion zone.

5.3 LEVEL C - ROUTINE DECONTAMINATION

Step 1 - Equipment Drop

- Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths.
- Decontaminate or dispose of items before removal from the exclusion zone.

Step 2 - Outer Boot/Glove Wash and Rinse

- Scrub outer boots/gloves and/or splash suit with decontamination solution.
- Rinse using water.

Step 3 - Outer Boot/Glove Removal

- Remove outer boots/gloves.
- If outer boots/gloves are disposable, deposit in container with plastic liner.
- If outer boots/gloves are non-disposable, store in a clean, dry place.

Step 4 - Outer Garment Removal

- Remove chemical protective outer garments and deposit in appropriate container.

Step 5 - Respiratory Protection Removal

- Remove hard hat and respirator and deposit on a clean surface.
- Discard respirator cartridges in appropriate container.
- Wash and rinse respirator.
- Wipe off and store respirator in a clean, dry location.

Step 6 - Inner Glove Removal

- Remove inner gloves.
- Deposit in container for disposal.

Step 7 - Field Wash

- Thoroughly wash hands and face with soap and water.
- Shower as soon as possible.

For Cartridge Exchange Only, Complete the Following Steps:

Step 1 - Equipment Drop

- Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths.
- Decontaminate or dispose of items before removal from the exclusion zone.

Step 2 - Glove Wash and Rinse

- Scrub gloves and/or splash suit with decontamination solution.
- Rinse using water.

Step 3 - Glove Removal

- Remove gloves.
- If gloves are disposable, deposit in container with plastic liner.
- If gloves are non-disposable, store in a clean, dry place.

Step 4 - Respirator Cartridge Change

- Exchange respirator cartridges.
- Don new outer boots/gloves.
- Tape joints and return to the exclusion zone.

5.4 LEVEL D - MODIFIED ROUTINE DECONTAMINATION

Step 1 - Equipment Drop

- Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths.
- Decontaminate or dispose of items before removal from the exclusion zone.

Step 2 - Outer Boot/Glove Wash and Rinse

(Optional, include if necessary for gross decontamination).

- Scrub outer boots/gloves and/or splash suit with decontamination solution.
- Rinse using water.

Step 3 - Outer Boot/Glove Removal

- Remove outer boots/gloves.
- If outer boots/gloves are disposable, deposit in container with plastic liner.
- If outer boots/gloves are non-disposable, store in a clean, dry place.

Step 4 - Outer Garment Removal

- Remove chemical protective outer garments and deposit in an appropriate container.
- Remove hard hat and safety glasses. Decontaminate as necessary. Deposit on a clean surface.

Step 5 - Inner Glove Removal

- Remove inner gloves.
- Deposit in a container for disposal.

Step 6 - Field Wash

- Thoroughly wash hands and face with soap and water.
- Shower as soon as possible.

APPENDIX J

TRENCHING

TABLE OF CONTENTS

Page

TABLE OF CONTENTS

TRENCHING/EXCAVATION

1.0 INTRODUCTION

This procedure provides the minimum requirements for safe work practices during excavation and trenching operations. This procedure is intended to assure compliance with the Occupational Safety and Health Act (OSHA) standards for these activities (29 CFR 1926, Subpart P).

This procedure applies to all excavation and trenching operations conducted by CRA. The selected contractor must develop their own Standard Operating Procedure (SOP) which adheres to this SOP and is in compliance with the OSHA regulations.

1.1 DEFINITIONS

The following definitions apply specifically to excavation and trenching operations.

Competent Person:	A worker who is trained and capable of identifying existing and predictable hazards of excavations. Such workers must have the authority to shut down operations if new hazards are identified.
Registered Professional Engineer:	A person who is registered as a Professional Engineer (PE) in the state where the work is to be performed. OSHA recommends using civil engineers or those with licenses in a related discipline and experience in the design and use of slopping and shoring systems. PE qualifications must be documented in writing.
Excavation:	Any man-made cut, cavity, trench, or depression in an earth surface, formed by dirt or rock removal. This includes landfills and piping trenches and openings caused by underground storage tank removal.
Cave-In:	Soil or rock falling into an excavation from the sides; soil or rock falling out from under a trench or support system.

	Cave-ins are usually sudden movements that can trap, bury, or crush workers in the excavation.
Benching:	A method of protecting workers from cave-ins by excavating the sides of an excavation to form a series of horizontal levels or steps.
Shoring:	Wooden, metal, or hydraulic bracing systems that support the sides of an excavation to prevent cave-ins.
Sloping:	Flattening the sides of an excavation at an angle to maintain stability and prevent cave-ins. Sloping angles are stated as the horizontal distance back from the foot of the slope, versus the vertical height of the slope. For example, 1.5 feet horizontal to 1 foot vertical (1.5:1). Slopes may also be stated as the number of degrees in the angle formed by the slope. A 1.5:1 slope is also a 34° angle. The larger the angle, the steeper the slope. A vertical wall is a 90° angle.

2.0 RESPONSIBILITIES

2.1 RESPONSIBILITIES OF THE PROJECT MANAGER (PM)

It is the PM's responsibility to communicate to the Site Supervisor that project activities will need to comply with the OSHA standards for excavation activities.

2.2 RESPONSIBILITIES OF THE PC AND/OR SITE SUPERVISOR

It is the responsibility of the Site Supervisor to implement the following components of the Excavation and Trenching Activities SOP as they relate to project activities.

i) that all excavations are completed in accordance with this SOP;

ii) that the proper protective materials and equipment are available to complete the excavation and/or trenching procedures;

iii) complete all inspections of the excavation as required; and

iv) submit any Subcontractor's Excavation and Trenching SOP to the HSC for review prior to initiating excavation activities.

3.0 REQUIREMENTS

3.1 PRE-PLANNING

Excavation and trenching operations require pre-planning to determine whether sloping or shoring systems are required, and to develop appropriate designs for such systems.

3.2 BURIED UTILITIES

The estimated location of all underground installations must be determined before digging begins. The local Underground Facilities Protective Organization (UFPO) or utility companies must be contacted and requested to locate such underground public utilities at least 2 business days prior to the start of work. Property owners and facility operators must also be contacted prior to project startup, to locate underground private utilities and installations. Ground-penetrating radar or other equipment may be useful in locating such utilities.

When excavations approach the estimated location of the underground utilities, exact locations must be determined by hand shoveling, poking wood or brass rods into the ground, or some other means of safely identifying and uncovering them.

All underground installations must be protected, supported, or removed in order to prevent injuries and damage during excavation. Where utilities or underground installations will be removed, they must be drained, flushed, de-energized, and locked out and tagged prior to removal.

3.3 ABOVEGROUND STRUCTURE AND LANDSCAPING

If there are any nearby buildings, walls, sidewalks, tress, or roads that may be threatened or undermined by the excavation, where the stability of any of these items may be endangered by the excavation, they must be removed or supported by adequate shoring, bracing, or underpinning.

Excavations may not go below the base of footings, foundations, or retaining walls, unless they are adequately supported or a PE has determined that they will not be affected by the soil removal (see definition of PE above).

3.4 PERSONNEL ENTRY INTO EXCAVATIONS

Personnel required to enter or work in the excavation at any time must be protected from the hazards of cave-ins. This requires the use of sloping and/or shoring systems that comply with State and Federal OSHA standards.

3.5 MAXIMUM EXCAVATION DEPTHS

Excavations less than 5 feet deep do not require sloping or shoring IF a "competent person" examines the ground and finds no indication of a potential cave-in (see the definition of "competent person" above).

Excavations greater than 5 feet deep must be sloped or shored to protect personnel working inside.

Excavations deeper than 20 feet must be subjected to soil classification, regardless of whether workers enter the hole or not. Sloping and/or shoring systems for such excavations must be approved by a PE who is licensed in the state where the work will take place.

3.6 PERSONNEL ENTRANCE AND EXIT LADDERS/RAMPS

Where personnel must enter excavations greater than 4 feet deep, ladders or stairs must be provided so that workers are not required to travel more than 25 feet to reach an exit.

3.7 VEHICLE TRAFFIC

Personnel exposed to vehicle traffic must wear high-visibility warning vests. Measures must be put in place to route traffic away from or safely around excavations. This includes placing traffic barriers, traffic cones, and high-visibility warning signs.

Vehicle traffic and heavy equipment can create vibration that may make the excavation unstable. Where such hazards exist, sloping and shoring systems must be designed to withstand these vibrations.

3.8 OXYGEN DEFICIENCY AND HAZARDOUS ATMOSPHERES

All excavations greater than 4 feet deep will be monitored for oxygen deficiency and any hazardous atmospheres (such as methane, hydrogen sulfide, or volatile organic compounds) if there is any risk of these accumulating in the excavation. If a hazardous atmosphere is present, ventilation or other control systems must be used to remove the hazard. In addition, where ventilation is used, air monitoring must be repeated every 15 minutes to verify that the excavation remains safe for workers to enter.

Emergency rescue equipment and a safety standby person must be present at the excavation whenever hazardous atmospheres exist or could reasonably develop.

3.9 WATER TABLE DEPTHS AND WATER ACCUMULATION IN EXCAVATIONS

The height of the local water table must be determined if there is any possibility of water entering or accumulating in the excavation and if there is any possibility of rain or snowfall occurring during excavation operations.

If rain or snow falls or water enters the excavation between work shifts, the excavation must be thoroughly inspected and certified safe by the "competent person" on site before anyone re-enters the hole.

Personnel are not permitted to work in excavations where water is accumulating or has accumulated UNLESS the water is continuously pumped out and the sloping or shoring system has been designed to withstand exposure to water without cave-ins. Personnel working in such wet conditions will also wear safety harnesses and rescue lines attached to a stable tie-off point at the top of the excavation that is capable of withstanding 5,000 pounds of force for each attached worker.

3.10 SPOILS PILES, EQUIPMENT, AND TOOL STORAGE

Small equipment, tool storage, shoring supplies, and spoils piles must be placed at least 2 feet away from the top edge of the excavation. In addition, heavy equipment and vehicles must be positioned at least 2 feet from the top edge of the excavation.

3.11 EQUIPMENT OPERATOR VISIBILITY DURING EXCAVATION ACTIVITIES

Assess whether heavy equipment operators will be able to clearly see the excavation edge while working. When equipment operators do not have a clear and direct view of the edge, barricades, stop logs, or hand signals must be used to warn them of their positions.

3.12 PERSONNEL WORKING ON EXCAVATION FACE

If personnel will be working on the excavation face at more than one level, they must be protected from falling rock or soil that may be generated by others working at levels above them. Protective barricades will be necessary at intervals along the face to provide this protection. The excavation face may also be scraped to remove loose materials.

Personnel are prohibited from working, standing, or traveling below loads being lifted or moved. Such loads include the buckets of excavators, backhoes, and loaders. Drivers of vehicles that are being loaded must remain in the vehicle cabs during loading.

3.13 PERSONNEL AND EQUIPMENT CROSSOVER POINTS

Where personnel or equipment will be required to cross over the excavation, walkways, or bridges with standard 42-inch high guardrails, midrails, and 6-inch high toeboards must be provided across the excavation. These bridges must be strong enough to withstand the weight of people, objects, and vehicles traveling across them.

4.0 SOIL TYPES

OSHA classifies soils into one of three types: A, B, or C. OSHA sloping and shoring requirements are based on the types of soil present at each work site.

Note that the definitions of these soil types are specific to compliance with OSHA excavation and trenching regulations. These definitions do not necessarily match terms used in geology or engineering soil studies.

4.1 TYPE A SOILS

Type A soils are defined as cohesive. They stick together easily and resist breaking apart under pressure. Clay, silty clay, sandy clay, and clay loam are examples of cohesive soils.

Type A soils must have an unconfined compressive strength greater than or equal to 1.5 tons per square foot.

Soil cannot be classified as Type A if it is fissured, subject to vibration, or if it has been previously disturbed or backfilled.

4.2 TYPE B SOILS

Type B soils include cohesive soil that has an unconfined compressive strength between 0.5 and 1.5 tons per square foot. Soil that has an unconfined compressive strength greater than 1.5 tons per square foot and is fissured or subject to vibration is also classified as Type B.

Some other soils that are granular and exhibit poor cohesion may be included as Type B materials. Angular gravel (similar to crushed rock), silt, silty loam, and sandy loam are examples of these materials.

4.3 TYPE C SOILS

Type C soils include cohesive soil that has an unconfined compressive strength less than 0.5 tons per square foot. Loose granular soils such as gravel, sand, and loamy sand are also classified as Type C.

5.0 OSHA SOIL CLASSIFICATION PROCEDURES

Soil classification must be done in accordance with methods described in the OSHA excavation standard. Visual examination will be followed by at least one manual test until the material is classified as Type A, B, or C.

A large chunk of soil, about the size of a backhoe bucket, should be used to make the classification. Samples must be collected in an undisturbed area before excavation begins.

It may be necessary to examine multiple samples to address the possibility of layering or multiple soil types in the proposed excavation or trench. If layers are present, each layer must be classified separately.

5.1 VISUAL EXAMINATION

Is the material entirely solid rock without cracks or fissures?

YES: Type A. Verify this by testing the unconfined compressive strength as described in Section 6.2, below.

Is the material submerged under water, saturated with water, or seeping water?

YES: Type C

Does the excavated soil remain in clumps?

NO: Type C

YES: Perform manual testing as described in Section 6.2, below.

5.2 MANUAL TESTING

Test the material for its unconfined compressive strength by one or both of the following methods.

Method A:

Can a thumb be pressed into the soil several inches with very little effort?

YES: Type C. Compressive strength is less than 0.5 tons per square foot (tsf)

NO: Is the material fissured, cracked, or subject to vibration?

YES: Type C

NO: Type A or B

If the material is fissured, cracked, subject to vibration, previously disturbed, or backfilled, it drops a level in the hierarchy of stability.

Method B (most accurate):

Press a pocket penetrometer into a ball of soil.

Less than 0.5 tsf, Type C

Between 0.5 and 1.5 tsf, Type B

Greater than 1.5 tsf, Type A

If the material is fissured, cracked, subject to vibration, previously disturbed, or backfilled, it drops a level in the hierarchy of stability.

To confirm the decision to classify soil as Type B or C, perform a plasticity test. Roll a lump of soil into a rope that is no more than 1/8 inch thick and is at least 2 inches long. Does the rope break when it is lifted into the air by one end?

YES: Type C

NO: Type B

5.3 DOCUMENTATION

Soil classifications must be documented in writing. This may be done as part of the site's daily operating logs. Documentation must include, as a minimum:

i) date and time of sample collection and testing;

ii) location of soil sample collection;

iii) physical condition and description of sample and any layering observed;

iv) methods used for classifying soil types;

v) results of soil classification; and

vi) name of the "competent person" who performed the soil classification.

6.0 LAYERED SOILS

In situations where different soil layers are present, each layer must be classified separately as Type A, B, or C. Where unstable soil is present underneath a stable soil layer, the sloping or shoring system for the entire excavation must meet the requirements for the most unstable soil. For example: if Type C soil is present under a layer of Type B, the entire excavation or trench must use the sloping or shoring requirements for Type C soil.

If Type B soil is present under Type C, the lower layer may be sloped or shored to meet Type B requirements and the upper layer to meet Type C.

7.0 SELECTION AND DESIGN OF SLOPING SYSTEMS

Sloping systems must be selected to meet the requirements of Appendix B of the OSHA excavation standard 29 CFR 1926, Subpart P. This appendix provides detailed diagrams and specifications for the allowable angle of sloped excavations and trenches based on the types of soil present.

Sloping designs for excavations greater than 20 feet deep must be prepared by a PE. OSHA allows four options for sloping excavations less than 20 feet deep.

7.1 ONE AND ONE-HALF TO ONE SLOPING

Excavations may be sloped to a 34° angle or flatter without classifying the soil types or consulting a PE. This angle is equal to cutting the excavation back 1.5 feet horizontally for every 1 foot of depth.

This option may be impractical if the excavation is very deep or if the area around the excavation is restricted. Using the flattest slope, without classifying soil types, may result in removing substantially more soil than necessary. For example, a 10-foot deep hole would require removal of at least 2,250 cubic feet using 1.5:1 slope. If the soil is classified as Type B, with an allowable slope of 1:1; less than half as much soil (about 1,000 cubic feet) must be removed. This can provide significant savings in man-hours and disposal costs for contaminated soils.

7.2 STEEPER SLOPES

If soils are classified as Type A, B or C, in accordance with the OSHA standard, steeper sloping angles may be possible. In excavations less than 20 feet deep, Type A soils may be sloped at 0.5 foot horizontal to 1 foot vertical and Type B soils at 1 foot horizontal to 1 foot vertical. Type C soils must still use the 1.5 feet horizontal to 1 foot vertical slope.

7.3 ALTERNATIVE SLOPING DESIGNS BY PES

If soils are classified as Type A, B, or C, an alternative sloping system may be designed by a PE, based on other tabulated data or previous work experience. Where an alternative sloping system is used, at least one written copy of the design must be kept at the job site while the slope is being constructed. This copy must include the data or other information used to develop the design, a description of the soil classification procedure and results, the specified measurements for sloping, and the name of the PE who developed and approved the design.

7.4 BENCHING

Benching is a method of protecting personnel from cave-ins by cutting a series of horizontal levels or steps in the sides of an excavation. Benching may only be used when soils have been classified as Type A or B according to the OSHA excavation standard. The benching design must meet the requirements of Appendix B of the standard. Any alternative benching systems must be approved by a PE with the same written documentation as described in Section 5.3.

8.0 SELECTION AND DESIGN OF SHORING SYSTEMS

Shoring systems must be selected to meet the requirements of Appendix C or D of the OSHA excavation standard 29 CFR 1926, Subpart P. This appendix provides detailed specifications for the strength, physical size, and number of timbers or other structural materials used to build shoring systems.

Shoring systems for excavations greater than 20 feet deep must be designed by a PE. OSHA allows similar options to those described for sloping, when selecting shoring for excavations less than 20 feet deep.

8.1 WOOD AND ALUMINUM SHORING SPECIFICATIONS

If soils are classified as Type A, B, or C in accordance with the standard, a wood or aluminum shoring system may be selected from Appendices C or D of the OSHA excavation standard 29 CFR 1926, Subpart P.

Note that lumber used to construct shoring must be new, previously unused, and free of knots or cracks.

The size of wooden timbers listed in Appendix C of 29 CFR 1926, Subpart P, is the actual size of the lumber, NOT the nominal size that is usually quoted when pre-cut timbers are sold. Timbers used for shoring systems must usually be special ordered from a lumber yard or sawmill in the exact sizes listed in Appendix C of the OSHA excavation standard.

8.2 PRE-MANUFACTURED SHORING SYSTEMS

After classifying the soil types, OSHA also allows the employer to use pre-manufactured shoring systems. This involves using the manufacturer's specifications to determine which shoring system will be used. The manufacturer must approve any design changes in writing before there is any deviation from their original recommendations.

A written copy of the manufacturer's specifications and any approved changes, must be kept at the job site while the shoring is constructed.

8.3 ALTERNATIVE SHORING SYSTEMS DESIGNED BY A PE

If soils are classified as Type A, B, or C, an alternative shoring system may be designed by a PE, based on any other tabulated data or previous work experience.

Where an alternative shoring system is used, at least one written copy of the design must be kept at the job site while the shoring is being constructed.

This copy must include the data or other information used to develop the design, a description of the soil classification procedure and results, the specified measurements for shoring, and the name of the PE who developed and approved the design.

8.4 SHORING INSTALLATION AND REMOVAL

Shoring systems must be installed from the top down as excavation or trenching progresses. Removal must take place from the bottom up, with the hole being backfilled as the shoring is removed.

Workers may not enter the excavation until adequate shoring is in place to prevent a cave-in. Workers will not remain in the excavation during removal of shoring unless an alternate means of support is provided to prevent cave-ins.

9.0 TRENCH SHIELDS

Trench shields are structures designed to prevent workers from being injured in a cave-in. These devices are reinforced metal boxes that are placed inside trenches using a crane. The boxes may be stacked or placed side by side in order to fill the depth and width of a trench.

The top of the trench shield must extend at least 18 inches above the top of the excavation.

Workers are to remain within the trench shield at all times in the excavation. Trench shields will not prevent cave-ins. They do not support the walls of the trench. They only protect workers inside the box, if the trench caves in. An arm or leg outside the trench shield may be torn off or crushed by falling soil if a cave-in occurs.

All personnel will leave the excavation or trench while the trench shield is moved or repositioned.

Stacked trench shields must be bolted together and ladders must be provided for workers to enter and exit the boxes. The ladders must be placed inside the trench shield and must extend at least 3 feet above the top of the shield. Workers must have no more than 25 feet of travel to reach one of the ladders in an emergency.

10.0 COMPETENT PERSON INSPECTIONS

When personnel enter excavations, the excavations must be inspected at the start of each work shift by a "competent person" (see the definition of "competent person" above).

Inspections must include checking for any evidence of damage, defects, or loose parts in the shoring system. Personnel may not enter the excavation until any such problems have been corrected.

Inspections must also include looking for any evidence of possible cave-ins, hazardous atmospheres, water accumulation, undermining, or material breaking off the sides of the excavation. Any changes or new hazards must be addressed before workers enter the excavation.

Inspections must be repeated after rain or snowfall, after freezing or thawing, and after any other hazard-increasing occurrence.

When a new hazard is identified while workers are in the excavation, all exposed personnel must be evacuated from the excavation until the situation is corrected.

Daily inspections will be documented in writing in the site's daily operating logs.

11.0 BARRICADES AND WARNING SIGNS

Unattended excavations, and those in remote areas, require barricades or covers with warning signs to prevent persons and equipment from falling into them. Large excavations may require temporary fencing to prevent unauthorized access. Barriers with flashing warning lights will be used when excavations are left open after dark.

APPENDIX K

ELECTRICAL SAFETY

TABLE OF CONTENTS

ELECTRICAL SAFETY

1.0 INTRODUCTION

The objective of the Electrical Safety Standard Operating Procedure (SOP) is to provide electrical safety guidelines, procedures, and inspections for the purpose of ensuring the safety of all Site personnel. Additionally, adherence to this SOP ensures compliance with the Occupational Safety and Health Administration (OSHA) requirements.

2.0 SCOPE

The scope of this SOP applies to all Conestoga-Rovers & Associates (CRA) personnel and subcontractors involved with field or construction activities utilizing electrical power. Electrical inspections are to occur during initial Site setup and monthly thereafter. These inspections are to be documented via either the Superintendent's logbook, the Site Health and Safety Officer's (HSO) logbook, or on the attached forms. The frequency of the inspections are to occur initially and then on a monthly basis thereafter. These forms can provide guidance for conducting the inspection as well as documenting them.

3.0 RESPONSIBILITIES

3.1 SUPERINTENDENTS/EQUIPMENT MANAGERS

It is the responsibility of the Site Superintendent (SS) and/or the Equipment Manager (EM) to assign a "competent person" to inspect and test electrical equipment. Additionally, the SS and or EM are to ensure that the Assured Equipment Grounding Conductor Program (See Section 4.0) is implemented on Site.

3.2 COMPETENT PERSON

The competent person has the responsibility to inspect and test on-Site electrical equipment and tools, including faulty insulation, improper grounding, loose electrical connections, and defective parts. The competent person will conduct testing and inspections upon initial project setup and monthly thereafter.

3.3 EMPLOYEES

Employees and subcontractors have the responsibility to follow the Project Safety Program and the constituents of this SOP. This includes the daily visual inspection of cord sets, electrical tools, or other pieces of electrical equipment before use.

4.0 ASSURED EQUIPMENT GROUNDING CONDUCTOR PROGRAM

4.1 GENERAL

As per OSHA, correct ground-fault protection requires the use of either Ground Fault Circuit Interrupters (GFCIs), which are devices that prevent electrical shock or an Assured Equipment Grounding Conductor Program. An Assured Equipment Grounding Conductor Program is a program that covers the inspection, repair and/or maintenance of cords and receptacles that are not part of the permanent wiring of a building, and equipment connected by cord and plug not protected by a GFCI.

4.2 APPROVED TESTING PROCEDURES

These following testing procedures are required by law before first use, after any repairs, after any suspected damage may have occurred, and at quarterly intervals. Any equipment in need of repair shall be taken out of service until repairs have been made.

4.2.1 TESTING FOR CONTINUITY

The continuity test is used to assure that the equipment grounding conductor is electrically continuous. It must be performed on all cords and receptacles that are not part of the permanent wiring. This testing can be accomplished with a continuity tester.

4.2.2 VISUAL TESTING

Receptacles and attachment caps or plugs are visually inspected to ensure that the equipment grounding is attached to its proper terminal.

4.3 INSPECTION DOCUMENTATION PROCEDURES

The required equipment inspections, tests, and testing date will be recorded, and the record is to be kept in the on-Site project file or in the Site Superintendent's or HSO's logbook. Electrical equipment used on Site will be inspected for damage or defects before each days use, and any equipment that is found to be defective will be taken out of service immediately.

APPENDIX L

RESPIRATORY PROTECTION PROGRAM

TABLE OF CONTENTS

TABLE OF CONTENTS

RESPIRATORY PROTECTION

1.0 INTRODUCTION

It is the policy of Conestoga-Rovers & Associates (hereby referred to as CRA) personnel to provide employees with a safe and healthful working environment. This is accomplished by utilizing facilities and equipment that have all feasible safeguards incorporated into their design. When effective engineering controls are not feasible, such as on a hazardous waste or construction sites or when they are being initiated, protection shall be used to ensure personnel protection.

1.1 SCOPE

This program applies to all employees who are required to wear respirators during normal work operations. This includes all active field staff and some laboratory personnel. Currently, this program does not specifically address the voluntary use of respirators, as any utilization of respiratory devices is considered sanctioned under this current program.

This program does not apply to contractors, subcontractors, or subconsultants, as they are responsible for providing their own respiratory protection programs, respiratory protective equipment, training, and fit testing.

2.0 RESPONSIBILITIES

2.1 INDUSTRIAL HYGIENE AND SAFETY GROUP

The Industrial Hygiene and Safety Group (IHSG) is collectively responsible for establishing and maintaining this respiratory protection program consistent with the goal of protecting CRA personnel. IHSG will oversee this respiratory protection program which is designed and organized to ensure respirators are properly selected, used, and maintained by CRA personnel, and to meet federal regulatory standards (29 CFR 1910.134) and industry accepted standards (ANSI).

IHSG is also responsible for evaluating those tasks for which respiratory protection is thought to be necessary, determine the degree of hazard posed by the potential exposure, determine whether engineering or administrative controls are feasible, and will specify which respiratory protection device is to be used at each task. In addition, IHSG will train personnel in the selection and use of respiratory protective devices, conduct qualitative and quantitative fit testing, and issue necessary protective devices.

2.2 OCCUPATIONAL HEALTH CLINICS

The CRA Contracted Occupational Health Clinics are charged with establishing medical evaluation and surveillance procedures and reviewing the health status of all personnel who may be required to wear respiratory protective equipment in the completion of their assigned tasks.

2.3 SUPERVISORS/PROJECT MANAGERS

Supervisors and Project Managers will ensure each employee under his or her supervision using a respirator has received appropriate training in its use and an annual medical evaluation. Supervisors will ensure the availability and use of appropriate respirators and accessories, provide adequate storage facilities, and encourage proper respiratory equipment maintenance. Supervisors must be aware of tasks requiring the use of respiratory protection, and ensure all employees engaged in such work use the appropriate respirators at all times.

2.4 RESPIRATOR WEARERS

It is the responsibility of each respirator wearer to wear his/her respirator when and where required and in the manner in which he/she was trained. Respirator wearers must report any medical issues related to respirator use, or malfunctions of the respirator to his/her supervisor, the site safety officer, or the IHSG immediately. The respirator wearer must also guard against mechanical damage to the respirator, clean and maintain the respirator as instructed, and store the respirator in a clean, sanitary location.

2.5 OTHERS

Personnel, such as clients, inspectors, and visitors, who must enter an area where the use of respiratory protective equipment is required, shall have and use appropriate equipment, and have been instructed by their respective companies in respirator use and limitations. Visitors shall have been fit tested and proven medically qualified by their company to wear the respirator prior to entry to a site. CRA shall obtain proof of such training and medical requirements from the visitor's company. If a site Health and Safety Plan (HASP) exists, in accordance with that plan, the visitor must be briefed on site-specific hazards.

Contractors are required to develop and implement a respiratory protection program for their employees who must enter into or work in areas where exposure to hazardous materials cannot be controlled or avoided. This program must meet OSHA regulations and include issuance of respirators, medical evaluations, fit testing, and training. A copy of a contractor's respiratory protection program should be part of their HASP.

3.0 MEDICAL SURVEILLANCE

CRA has strategically contracted with medical providers located near all of its offices to provide Occupational Medical coverage for its staff. The Occupational Physician or Occupational Health Clinic, initially, and periodically thereafter, makes a determination as to whether or not an employee can wear a respirator without physical or psychological risk. Based on the overall health of the individual and special medical tests (pulmonary function studies, EKG, etc.) as appropriate, the examining physician determines whether the individual will be restricted from wearing respiratory protective equipment. If a medical restriction is applied, the employee and the IHSG are formally notified of the restriction. The IHSG will communicate to the employee's supervisor. Specific medical tests and procedures will be determined by the Occupational Health Physician and will be in accordance with current OSHA medical surveillance requirements and/or NIOSH recommendations.

The medical evaluation will be repeated annually for persons wearing respirators for more than 30 days per year, other more casual users will be evaluated biennially. Any employee refusing the medical evaluation will not be allowed to work in areas requiring respirator use or on any site where respirator use may be necessary as a contingency.

4.0 SELECTION AND USE OF RESPIRATORY PROTECTIVE DEVICES

4.1 RESPIRATOR USE

Respiratory protection is authorized and issued for the following personnel:

- Employees in areas known to have contaminant levels requiring the use of respiratory protection or in which contaminant levels requiring the use of respiratory protection may be created without warning (e.g., emergency purposes such as hazardous material spill responses, plant maintenance, and confined space entry).
- Employees performing operations documented to be health hazards and those unavoidably required to be in the immediate vicinity where similar levels of contaminants are generated (e.g., hazardous waste site oversight or construction).
- Employees in suspect areas or performing operations suspected of being health hazards but for which adequate sampling data has not been obtained (e.g., laboratory and research functions, treatment plant maintenance, and some construction).

4.2 RESPIRATOR SELECTION

Selection of the proper respirator(s) to be used in any work area or operation is made only after a determination has been made as to the real and/or potential exposure of employees to harmful concentrations of contaminants in the workplace atmosphere. This evaluation will be performed prior to the start of any routine or non-routine tasks requiring respirators and is usually identified in the HASP. Respiratory protective devices will be selected by the IHSG, using ANSI Z88.2, OSHA Rules, NIOSH Certified Equipment List, and/or the NIOSH Respirator Selection Decision Logic as a guide. The following items will be considered in the selection of respirators:

- Effectiveness of the device against the substance of concern;
- Estimated maximum concentration of the substance in the work area;
- General environment (open area or confined space, etc.);
- Known limitations of the respiratory protective device;
- Comfort, fit, and worker acceptance; and
- Other contaminants in the environment or potential for oxygen deficiency.

Supervisors and project managers shall contact IHSG prior to non-routine work which may expose workers to hazardous substances or oxygen deficient atmospheres. Examples of work which may require the use of respirators includes, but are not limited to:

- Abrasive blasting;
- Cutting or melting lead or stripping lead-based paints from surfaces;
- Treatment plant operation and maintenance (O&M) activities;
- Welding or burning;
- Painting, especially with epoxy or organic solvent coatings;
- Using solvents, thinners, or degreasers;
- Any work which generates large amounts of dust;
- Working in a confined space;
- Hazardous waste site work; and
- Exposure to bioaerosols.

A review of the real and/or potential exposures is made periodically to determine if respiratory protection continues to be required, and to verify that the previously chosen respirators still provide adequate protection. The frequency of this assessment is based on the duration of the field activity, or for stationary activities (e.g., laboratory work) will not exceed 1 year.

4.2.1 SERVICE LIFE OF AIR-PURIFYING CARTRIDGES AND CANISTERS

The canisters or cartridges of air-purifying respirators are intended to be used until filter resistance precludes further use, or the chemical sorbent is expended as signified by a specific warning property (e.g., odor, taste, etc.). Under recent regulation, waiting for breakthrough to change cartridges is an unacceptable practice. Because CRA does not work with specific identifiable chemicals, the site-specific HASP will specify when cartridges must be changed. If not mentioned in the HASP, at a minimum, cartridges or filters shall always be provided when a respirator is reissued and shall be changed at least on a daily basis regardless of saturation condition. When in doubt about the previous use of the respirator, obtain a replacement canister or cartridge.

The following is a partial list of factors that may affect the usable cartridge service life and/or the degree of respiratory protection attainable under actual workplace conditions. These factors should be considered when developing a cartridge change-out schedule in a HASP.

- Type of contaminant(s).
- Contaminant concentration.
- Relative humidity.
- Breathing rate (workload).
- Temperature.
- Changes in contaminant concentration, humidity, breathing rate, and temperature.
- Mixtures of contaminants: (1) multiple contaminants present simultaneously versus (2) alternate usage of the same cartridges against different contaminants on different occasions.
- Accuracy in the determination of the conditions.
- The contaminant concentration in the workplace can vary greatly. Consideration must be given to the quality of the estimate of the workplace concentration.
- Cartridge storage conditions (exposure to trace levels of contaminants and humidity and elevated temperatures).
- Storage conditions between multiple uses of the same respirator cartridges. It is recommended that the chemical cartridges be replaced after each work shift. Contaminants adsorbed on a cartridge (especially low boiling point materials, BP <65°C) can migrate through the carbon bed without airflow. Desorption of the contaminant (including those with poor warning properties) after partial use of the chemical cartridge can occur after a short period (hours) without use (e.g., overnight) and result in a non-use exposure to someone nearby (e.g., in an office trailer).
- Age of the cartridge.
- Condition of the cartridge and respirator.
- Respirator and cartridge selection.
- Respirator fit.
- Respirator assembly, operation, and maintenance.
- User training, experience, and medical fitness.
- Warning properties of the contaminant.

- The quality of the warning properties should be considered when establishing the chemical cartridge change schedule. Good warning properties may provide a secondary or backup indication for cartridge change-out. Change schedules for contaminants with poor warning properties may require a greater safety factor than a contaminant with good warning properties.
- Other conditions specific to the particular user and/or workplace.

Ultimately, the cartridge manufacturer has to be consulted to calculate/predict cartridge change-out procedures based on the chemicals of concern and the variable factors listed above. This potentially will differ with each brand of respirator used at CRA.

4.3 TYPES OF RESPIRATORS

When respirators are used, the predominate type employed by CRA is the air-purifying device. Infrequently, CRA utilizes air-supplied respirators. These devices are used when USEPA Level B is specified in a HASP.

4.3.1 AIR-PURIFYING RESPIRATOR

These respirators remove air contaminants by filtering, absorbing, adsorbing, or chemical reaction with the contaminants as they pass through the respirator canister or cartridge. This respirator is to be used only where adequate oxygen (19.5 to 23.5 percent by volume) is available. Air-purifying respirators can be classified as follows:

- Particulate removing respirators, which filter out dusts, fibers, fumes, and mists. These respirators may be single-use disposable respirators or respirators with replaceable filters.
- Gas- and vapor-removing respirators, which remove specific individual contaminants or a combination of contaminants by absorption, adsorption or by chemical reaction. Gas masks and chemical-cartridge respirators are examples of gas- and vapor-removing respirators.
- Combination particulate/gas- and vapor-removing respirators, which combine the respirator characteristics of both kinds of air-purifying respirators.

4.3.2 SUPPLIED-AIR RESPIRATORS

These respirators provide breathing air independent of the environment. Such respirators are to be used when the contaminant has insufficient odor, taste, or irritating warning properties, or when the contaminant is of such high concentration or toxicity that an air-purifying respirator is inadequate. Supplied-air respirators, also called air-line respirators, are classified as follows:

- Demand - This respirator supplies air to the user on demand (inhalation) which creates a negative pressure within the facepiece. Leakage into the facepiece may occur if there is a poor seal between the respirator and the user's face. CRA does not own or use this type of device.
- Pressure-Demand - This respirator maintains a continuous positive pressure within the facepiece, thus preventing leakage into the facepiece.
- Continuous Flow - This respirator maintains a continuous flow of air through the facepiece and prevents leakage into the facepiece. The air supply for this type of respirator is usually associated with an air compressor.

4.3.3 SELF-CONTAINED BREATHING APPARATUS

This type of respirator allows the user complete independence from a fixed source of air and offers the greatest degree of protection but is also the most complex. Training and practice in its use and maintenance is essential. This type of device will be used in emergency situations or where USEPA Level A or B protection is required.

4.3.4 AIR QUALITY FOR SUPPLIED-AIR RESPIRATORS

When any form of supplied-air respirator is used, the breathing air supply shall meet or exceed the ANSI/Compressed Gas Association (CGA-G7.1-1989) Standards for Grade D breathing air. This air quality must be verified with the air supplier and/or tested in the field for quality control purposes. Consult with IHSG for the latest protocol.

4.4 IDENTIFICATION OF RESPIRATOR CARTRIDGES AND GAS MASK CANISTERS

Respirator cartridges and canisters are designed to protect against individual or a combination of potentially hazardous atmospheric contaminants, and are specifically labeled and color coded to indicate the type and nature of protection they provide.

The NIOSH approval label on the respirator will also specify the maximum concentration of contaminant(s) for which the cartridge or canister is approved. For example, a label may read:

> *"DO NOT WEAR IN ATMOSPHERES IMMEDIATELY DANGEROUS TO LIFE. MUST BE USED IN AREAS CONTAINING AT LEAST 20 PERCENT OXYGEN. DO NOT WEAR IN ATMOSPHERES CONTAINING MORE THAN ONE-TENTH PERCENT ORGANIC VAPORS BY VOLUME. REFER TO COMPLETE LABEL ON RESPIRATOR OR CARTRIDGE CONTAINER FOR ASSEMBLY, MAINTENANCE, AND USE."*

4.5 WARNING SIGNS OF RESPIRATOR FAILURE

Particulate Air-Purifying

When breathing difficulty is encountered with a filter respirator (due to partial clogging with increased resistance), or if any irritation or odor is sensed in the mask, the filter(s) must be replaced and/or the facepiece checked for defective or missing valves. The employee is required to leave the area immediately to a safe area and service the respirator.

Gas or Vapor Air-Purifying

If, when using a gas or vapor respirator (chemical cartridge or canister), any of the warning properties (e.g., odor, taste, eye irritation, or respiratory irritation) occur, promptly leave the area and check the following:

- Proper face seal;
- Damaged or missing respirator parts; and
- Saturated or inappropriate cartridge or canister.

If no discrepancies are observed, replace the cartridge or canister. If any of the warning properties appear again, the concentration of the contaminants may have exceeded the cartridge or canister design specification. When this occurs, an airline respirator or SCBA is required.

Supplied-Air Respirator

When using an air line respirator, leave the area immediately when the compressor failure alarm is activated or if an air pressure drop is sensed. When using an SCBA, leave the area as soon as the air pressure alarm is activated or any irregularity is noticed.

5.0 RESPIRATOR TRAINING

All CRA field staff will receive training on the contents of the Respiratory Protection Program and their responsibilities under it. They will be trained on the proper selection and use, as well as the limitations of the respirator. Training also covers how to ensure a proper fit before use, and how to determine when a respirator is no longer providing the protection intended. IHSG provides training of respirator wearers in the use, maintenance, capabilities, and limitations of respirators initially upon assignment of personnel to tasks requiring the use of respirators. The initial training is incorporated into the required 40-hour Hazmat training and through other courses if the 40-hour Hazmat training is not applicable to an individual's job tasks. Retraining is given annually thereafter and only upon successful completion of the medical evaluation and is incorporated into the Hazmat annual refresher program or other CRA training programs.

The training program, which is also an integral part of the HASP, will include the following:

- The CRA respirator program and regulatory standards;
- Nature and degree of respiratory hazards;
- Fit testing and user fit checking;
- Respirator selection, based on the hazard and respirator capabilities and limitations;
- Donning and doffing procedures, fit tests, and hands-on practice;
- Emergency use procedures;
- Care of the respirator (e.g., need for cleaning, maintenance, storage, and/or replacement); and
- Use and limitations of respirators.

Respirator training will be properly documented and will include the type and model of respirator for which the individual has been trained and/or fit tested.

6.0 RESPIRATOR FIT TESTING

A fit test shall be used to determine the ability of each individual respirator wearer to obtain a satisfactory fit with any air-purifying respirator. Quantitative or qualitative fit tests will be performed only after the successful completion of a physical exam. Personnel will only be issued respirators for which they have been fit tested.

No employee is permitted to wear a negative-pressure respirator in a work situation until he or she has demonstrated that an acceptable fit can be obtained. Respirator fitting is conducted initially upon assignment to a task requiring use of a respirator.

Fit testing will be conducted by the IHSG in accordance with Appendix A of 29 CFR 1910.134. The test results will be the determining factor in selecting the type, model, and size of respirator for use by each individual respirator wearer. Refitting is conducted annually thereafter or at the request of an employee (e.g., after a change in body weight, facial scarring, etc.) Only the current fit test is considered valid for respirator selection and certification purposes. Prior year(s) test results are maintained on file by IHSG for documentation completeness.

6.1 FIELD FIT CHECKING

Each time a respirator is donned, the user will perform positive and negative pressure fit checks to verify that the respirator is seated correctly and that there are no gross abnormalities (e.g., missing exhalation or inhalation valve). These field checks are not intended to be a substitute for quantitative or qualitative fit testing. Respirator users must be properly trained in the performance of these field checks and understand their limitations.

6.1.1 NEGATIVE PRESSURE CHECK

Applicability/Limitations: This test cannot be carried out on all respirators; however, it can be used on facepieces of air-purifying respirators equipped with tight-fitting respirator inlet covers and on atmosphere supplying respirators equipped with breathing tubes which can be squeezed or blocked at the inlet to prevent the passage of air.

Procedure: Close off the inlet opening of the respirator's canister(s), cartridge(s), or filter(s) with the palm of the hand, or squeeze the breathing air tube or block its inlet so that it will not allow the passage of air. Inhale gently and hold for at least 10 seconds. If the facepiece collapses slightly and no inward leakage of air into the facepiece is detected, it can be reasonably assumed that the respirator has been properly positioned and the exhalation valve and facepiece are not leaking.

6.1.2 POSITIVE PRESSURE CHECK

Applicability/Limitations: This test cannot be carried out on all respirators; however, respirators equipped with exhalation valves can be tested.

Procedure: Close off the exhalation valve or the breathing tube with the palm of the hand. Exhale gently. If the respirator has been properly positioned, a slight positive pressure will build up inside the facepiece without detection of any outward air leak between the sealing surface of the facepiece and the face.

6.2 QUALITATIVE FIT TESTING

Federal regulations (29 CFR 1910.134) require at least qualitative fit tests of respirators and describe step-by-step procedures. This test checks the subject's response to a chemical introduced outside the respirator facepiece. The response is either voluntary or involuntary depending on the chemical used. Several methodologies may be used. The two most common are the irritant smoke test and the odorous vapor test. Fit tests will only be conducted by trained individuals certified by the IHSG to perform such testing. The procedures listed in Appendix A of 29 CFR 1910.134 will be followed.

Irritant Smoke

The irritant smoke test is an involuntary response test. Air-purifying respirators must be equipped with a high efficiency particulate air (HEPA) or a 100 series particulate filter (P, R, N) for this test. An irritant smoke, usually stannic chloride, is directed from a smoke tube toward the respirator. If the test subject does not respond to the irritant smoke after conducting a series of exercises, a satisfactory fit is assumed to be achieved. Any response to the smoke indicates an unsatisfactory fit and the test is concluded.

The chemical smoke is irritating to the eyes, skin, and mucous membranes. It should not be introduced directly onto the skin. The test subject must keep his or her eyes closed during the testing if a full-facepiece mask is not used.

Odorous Vapor

The odorous vapor test is a voluntary response test. It relies on the subject's ability to detect an odorous chemical while wearing the respirator. Air-purifying respirators must be equipped with an organic cartridge or canister for this test. Isoamyl acetate (artificial banana oil) is the usual test. An isoamyl acetate-saturated gauze pad is placed near the facepiece-to-face seal of the respirator of the test subject's skin. If the test subject is unable to smell the chemical after conducting a series of exercises, then a satisfactory fit is assumed to be achieved. If the subject smells the chemical, the fit is unsatisfactory.

If the subject cannot smell the chemical, the respirator will be momentarily pulled away from the subject's face. If the subject is then able to smell the chemical, a satisfactory fit is assumed. If the subject cannot smell the chemical with the respirator pulled away from the face, this test is inappropriate for this subject, and a different test will be used.

This test is limited by the wide variation of odor thresholds among individuals and the possibility of olfactory fatigue. Since it is a voluntary response test, it depends upon an honest response.

6.3 QUANTITATIVE FIT TESTING

Quantitative fit testing, using the Portacount Plus (condensing nuclei counter) fit test system, is generally performed on both full-face and half-face negative pressure respirators within CRA. Fit factors are determined by comparing the particle concentration outside the respirator with the concentration inside the respirator facepiece. An acceptable fit is achieved when the respirator wearer successfully completes a series of programmed exercises with a fit factor of 100 or more for half-mask devices and 1,000 or more on full-face devices. The procedures in Appendix A of 29 CFR 1910.134 will be followed.

6.4 SPECIAL PROBLEMS

Facial Hair

No attempt will be made by CRA to fit test an employee who has facial hair which comes between the sealing periphery of the facepiece and the face, or if facial hair interferes with normal functioning of the exhalation valve of the respirator. When a fitted respirator is worn to conduct work in the field, it is the wearer's responsibility to be clean shaven (less than 1 day's growth) in order to obtain an adequate respirator fit which is representative of the fit test. Violators of this requirement are subject to disciplinary action.

Glasses and Eye/Face Protective Devices

Proper fitting of a respiratory protective device facepiece for individuals wearing corrective eyeglasses or goggles may not be established if temple bars or straps extend through the sealing edge of the facepiece. If eyeglasses, goggles, face shield, or welding helmet must be worn with a respirator, they must be worn so as not to adversely affect the seal of the facepiece. If a full-facepiece respirator is used, special prescription glasses inserts are available if needed.

6.5 RECORDKEEPING

Respirator fit testing shall be documented and shall include the type of respirator, brand name and model, method of test and test results, test date, and the name of the instructor/tester. The IHSG will be responsible to maintain and keep fit testing records on file.

7.0 MAINTENANCE AND ISSUANCE OF RESPIRATORS

7.1 MAINTENANCE

The maintenance of respiratory protective devices involves a thorough visual inspection for cleanliness and defects (i.e., cracking rubber, deterioration of straps, defective exhalation and inhalation valves, broken or cracked lenses, etc.). Worn or deteriorated parts will be replaced prior to use. No respirator with a known defect is reissued for use. No attempt is made to replace components, make adjustments, or make repairs on any respirator beyond those recommended by the manufacturer. Under no circumstances will parts be substituted, as such substitutions will invalidate the approval of the respirator. Any repair to reducing or admission valves, regulators, or alarms will be conducted by either the manufacturer or a qualified trained technician.

7.2 CLEANING OF RESPIRATORS

All respirators in routine use shall be cleaned and sanitized on a periodic basis. Respirators used non-routinely shall be cleaned and sanitized after each use and filters and cartridges replaced. Routinely used respirators are maintained individually by the respirator wearer. Replacement cartridges and filters are obtained by contacting IHSG. Cleaning and disinfection of respirators must be done frequently to ensure that skin-penetrating and dermatitis-causing contaminants are removed from the respirator surface. Respirators maintained for emergency use or those used by more than one person must be cleaned after each use by the user.

The following procedure is recommended for cleaning and disinfecting respirators:

- Remove and discard all used filters, cartridges, or canisters.
- Remove speaking diaphragms, valve assemblies, and hoses.
- Wash facepiece and breathing tubes in a cleaner-disinfectant solution (usually purchased from the respirator manufacturer) in warm water (43°C [110°F] maximum). A soft hand brush may be used to remove dirt.
- Solvents which can affect rubber and other parts shall not be used.
- Rinse completely in clean, warm water. If the cleaner does not contain a disinfecting agent, respirator components can be immersed for 2 minutes in 1 milliliter bleach to 1 liter of warm water. Rinse again.

- Hand dry with a lint-free cloth or air dry in a clean area in such a way as to prevent distortion of the facepiece.
- Clean other respirator parts as recommended by the manufacturer.
- Inspect valves, head straps, and other parts to ensure proper working condition.
- Reassemble respirator and replace any defective parts.
- After drying and inspection, place in a clean, dry plastic bag or other suitable container for storage.

7.3 ISSUANCE OF RESPIRATORS

Respiratory protective equipment shall not be ordered, purchased, or issued to personnel unless the respirator wearer has received a physical, respirator training, and a fit test. New employees who require respiratory protective equipment must be placed into the respirator program before being issued equipment.

IHSG provides an assortment of types of devices. These facepieces have a variety of cartridges that may be worn with them. At the time of issue, the appropriate cartridge is determined, based on the user's needs, and is issued with the appropriate facepiece.

7.4 STORAGE

After inspection, cleaning, and any necessary minor repairs, store respirators to protect against sunlight, heat, extreme cold, excessive moisture, damaging chemicals, or other contaminants. Respirators placed at stations and work areas for emergency use shall be stored in compartments built for that purpose, shall be quickly accessible at all times and will be clearly marked. Routinely used respirators, such as full-face air-purifying respirators, shall be placed in sealable plastic bags. Unused cartridges should be removed from the facepiece and also stored in an airtight, sealable plastic bag. Respirators may not be stored in such places as tool boxes, equipment cases, or vehicles. Respirators shall be packed or stored so that the facepiece and exhalation valves will rest in a normal position, not be crushed and stored away from temperature extremes.

8.0 PROGRAM SURVEILLANCE

The ANSI Z88.2-1980 document entitled "Practices for Respiratory Protection" specifies:

> *"Section 3.5.15 Respirator Program Evaluation. An appraisal of the effectiveness of the respirator program shall be carried out at least annually. Action shall be taken to correct defects found in the program."*

The evaluation of the Respirator Program will include investigating wearer acceptance of respirators, inspecting respirator program operation, and appraising protection provided by the respirator. Evidence of excessive exposure of respirator wearers to respiratory hazards will be followed up by investigation to determine why inadequate respiratory protection was provided. The findings of the respirator program evaluation will be documented, and this documentation will list plans to correct faults in the program and set target dates for the implementation of the plans. These evaluations will be conducted by IHSG at least annually.

8.1 PROGRAM REVIEW

The last date that this program was reviewed in its entirety was July 2002.

9.0 RECORDKEEPING

A written copy of this program and the OSHA standard is available to all employees and can be obtained by contacting the IHSG.

The records generated by this program (training, fit testing, medical) shall be maintained by the IHSG.

APPENDIX M

RSSI's RADIOLOGICAL HEALTH AND SAFETY PLAN

Radiological Health and Safety Plan

For

Thorium Mitigation
At
247 East Ohio Street
Chicago, Illinois

Prepared for

CRA

By

RSSI
6312 WEST OAKTON STREET
MORTON GROVE, ILLINOIS

Dec 30, 2003

H:\HOME\400001 Health Physics\CRA\247\HASP - 247 East Ohio\RHASP - r42.doc

RADIOLOGICAL HEALTH AND SAFETY PLAN

Title: Radiological Health and Safety Plan

Revision Number: RSSI 1.4

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

PHONE NUMBERS

IN THE EVENT OF AN EMERGENCY DIAL 911

AMBULANCE SERVICE	911
FIRE DEPARTMENT..	911
EMERGENCY RESCUE SERVICE	911
POLICE DEPARTMENT	911
NATIONAL RESPONSE CENTER	1-800-424-8802
POISON CONTROL CENTER	1-800-732-2200
HOSPITAL – For Ambulatory Minor First Aid Mercy Hospital...2525 S. Michigan.......(See Project Safety Plan for Map)..	312- 567-2200
ILLINOIS EMERGENCY MANAGEMENT AGENCY (IEMA) EMERGENCY NUMBER	217-782-7860
PROJECT HEALTH PHYSICIST, Eli Port and ON-SITE HEALTH PHYSICIST, SangHo Nam – 24 Hour Emergency Number	847-965-1999
PROJECT SUPERINTENDANT-Overall On-Site Safety, Brian Janoski...	312-326-5800
ARGONNE NATIONAL LABORATORY – Whole Body Counting	630-252-5130

EMERGENCY PLAN

In the event work within the potentially impacted area (site specific) is required on an emergency basis, the following shall be incorporated to the extent possible, and all personnel working in the potentially impacted areas shall be given the opportunity to read this section of the Radiological Health and Safety Plan (RHASP).

A. PROTECT WORKERS POTENTIALLY EXPOSED TO CONTAMINATED MATERIAL

1. Notify workers that levels of radiation above background levels may be present.

2. Avoid inhaling or ingesting dust from contaminated areas.
   Minimize contact with contaminated material.
   Wear protective coveralls or disposable coveralls to facilitate decontamination of workers.

3. Survey material for contamination.

B. AVOID SPREAD OF CONTAMINATION

1. Avoid wash-off erosion of contaminated concrete

2. Cover rubble until screened for contamination.

3. Survey rubble and debris prior to transport away from project site.

4. Do not remove equipment which has been in contact with potential contamination until it has been surveyed and released.

C. MINIMIZE POTENTIAL PUBLIC CONTACT

1. Limit access to rubble and debris.

2. Cover rubble and debris to minimize fugitive dust. Wet dusty work.

3. Control off-site tracking by potentially contaminated boots or clothing.

D. MONITOR CONTAMINATION

1. Survey rubble from job.

2. Provide high volume air samplers to monitor for fugitive emissions.

3. Survey surfaces adjacent to potential or known contamination for radioactive material.

E. DISPOSAL

1. Rubble and debris shall be disposed of as required by law.

F. NOTIFY AUTHORITIES

1. Notify agencies identified on the enclosed emergency notification list.

Notification should include, as a minimum, the following

- Location of work
- Potential contact with thorium containing material
- Field survey maximum readings
- Sample maximum concentration

1.0 SCOPE OF PLAN

The following Radiological Health and Safety Plan (RHASP) will be used and modified as necessary in order to minimize and prevent exposures to thorium and thorium daughters at 247 East Ohio Street, Chicago, Illinois. All personnel assigned to this project will be required to review thoroughly the contents of the RHASP and to follow these policies and procedures. This RHASP is for use only by CRA, their designated contractors and consultants, and approved site visitors. Employees of Regulatory agencies are not considered visitors and will be required to conform to their agency's Health and Safety Plans.

This plan meets the requirements of OSHA 29 CFR 1910.1096, Ionizing Radiation; 32 IAC 340, Standards for Protection Against Radiation; 32 IAC 400, Notices, Instructions, and Reports to Workers; Inspections. Visitors will be required to review the Radiological Health and Safety Plan and read and sign the visitor information sheet (Figure 1.1).

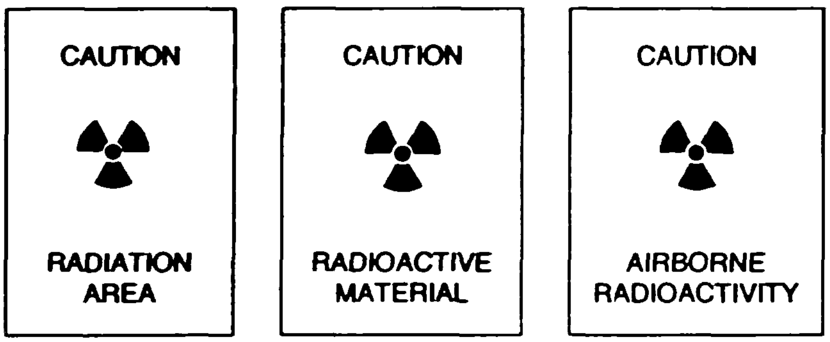
This plan primarily applies to radiological health and safety. The project safety plan addresses additional project health and safety issues and they should be used together for safe performance of this work. In addition, the CRA Logistics and Operation Plan provides descriptions of several safety measures.

FIGURE 1.1
VISITOR INFORMATION SHEET

VISITOR INFORMATION

NOTICE: ALL VISITORS MUST BE ESCORTED AT ALL TIMES WHILE ON THIS SITE.

CAUTON: Radiation hazards are present on this site.



CONTROLLED AREAS: Do not enter areas with these signs unless you have an escort or health physics has given specific approval and you understand access limitations. No smoking, eating, drinking or chewing in containment or controlled areas.

You must wear protective clothing in controlled areas. Health physics will provide you with instructions.

You must wear a personal radiation dosimeter if you enter containment or an area that is controlled.

No smoking, eating, drinking or chewing in containment or controlled areas. NO EXCEPTIONS.

Name______________________________ Date________________

2.0 SAFETY MANAGEMENT

The following safety management structure will be used for the implementation, administration, and monitoring of the RHASP. This plan applies to radiological health and safety. The CRA Logistics and Operations Plan (LOP) contains additional information about construction safety and other health and safety.

2.1 PROJECT SUPERINTENDANT

The project Superintendent has responsibility for overall on-site safety.

2.2 PROJECT HEALTH PHYSICIST AND ON-SITE HEALTH PHYSICIST

The Project Health Physicist (PHP) shall be responsible for the RHASP. The PHP and the On-Site Health Physicist (OHP) who reports to the PHP, have the authority to alter, modify, suspend or terminate work that the PHP or the OHP judges to be a threat to health, safety or the environment, or to be a violation of applicable rules and regulations. The OHP or designee shall monitor and maintain quality of the RHASP until project completion.

Principal duties of the PHP include:

- Review project background data,
- Approve all RHASP modifications,
- Conduct required on-site training,

Principal duties of the OHP include:

- Administer and enforce the RHASP,
- Evaluate the adequacy of personal protective equipment (PPE) ,
- Brief visitors on site conditions, and
- Administer surveys and personnel air monitoring procedures.

3.0 PERSONNEL RESPONSIBILITIES

The OHP will administer and supervise the RHASP at the work-site level. The OHP will monitor all operations, be the primary, on-site contact for radiological health and safety issues, and have full authority to alter, suspend, modify, or terminate any activity if conditions are judged to be hazardous to on-site personnel or the public.

The PHP will brief all personnel on the contents of the RHASP. Personnel will be required to review the RHASP, and have the opportunity to ask questions about the planned work or hazards. The PHP or the OHP will conduct toolbox safety meetings to familiarize site personnel with site conditions, boundaries, and physical hazards. Site personnel will conduct their assigned tasks in accordance with the RHASP at all times.

All individuals have a primary responsibility for their own health and safety and the health and safety of others. If at any time, site personnel observe radiological conditions, which could jeopardize personnel health and safety, they are required to immediately report their observations to the OHP.

Figure 3.1 - Areas Where Contamination Has Been Found Or Is Suspected

4.0 RADIATION HAZARD ASSESSMENT

The following are potential radiological hazards that may be present or associated with this project.

4.1 PRINCIPAL RADIOLOGICAL CONTAMINANTS (KNOWN OR SUSPECTED)

- Thorium-226 (Ra-226) and its progeny including,
- Radon-220 (Rn-220)

The contaminants are known to be present in the concrete at low concentrations. They may be present in other materials. The primary routes of entry into the body are:

ROUTE	ENTRY MADE VIA:
Inhalation	Ra-226 and Rn-220 progeny in airborne dust, and Rn-220 and its progeny in air.
Ingestion	Dust and aerosol containing Ra-226 and Rn-220 progeny.
Eye and Skin	Direct contact.
	Cuts and abrasions.
External	Penetrating radiation from gamma emitters in building materials.

4.2 MEDICAL EVALUATION AND SURVEILLANCE PROGRAM

All field project personnel shall receive a medical evaluation in accordance with 29 CFR 1910.120. Personnel who receive a medical evaluation will be provided the results of their evaluation by the medical contractor. This will be in the form of a confidential report addressed to the individual and will contain a breakdown of the clinical findings. In addition, it will indicate any areas of concern which would justify further medical consultation by the individual's personal physician. In the event that the areas of concern are of a severe nature, a follow-up notification will be made to the individual by the medical consultant to answer any questions the employee may have.

4.2.1 Dosimetry/Personnel Monitoring

All project personnel shall participate in a dosimetry program administered by the PHP. (The dosimetry processor shall be accredited by the National Voluntary Laboratory Accreditation Program.) The PHP shall maintain records of all radiation doses received by field personnel, including all contractors. These records shall comply with the requirements of 32 IAC 340.4010. The PHP shall review the results of personal exposure monitoring to determine compliance with exposure limit requirements.

4.2.2 Requirement for Dosimetry

Personal dosimetry is required for an individual who, while on-the-job, may receive in one calendar quarter a dose in excess of 10% of the limits in 29 CFR 1910.1096(b)(1). All individuals working in a Radiation Area or in containment shall be issued and shall be required to wear a thermoluminescent dosimeter (TLD) or an optically stimulated luminescence (OSL) dosimeter.

4.2.3 Bioassay

Bioassay is the determination of the types and amounts of radioactive materials, which are in the body. By analyzing the deposition, the excretion, and any other available information regarding placement in the body, internal exposures from radioactive materials can be estimated.

Based on levels documented bioassays are not likely to be required for the proposed mitigation activities. The determination of a need for bioassay will be based on air monitoring, review and by recommendations from the PHP. If necessary, Argonne National Laboratory will be requested to perform whole body counting.

4.2.4 Emergency Medical Treatment

First aid for minor injuries should be administered on-site if possible. The individual should be decontaminated if necessary and possible without compromising first aid, depending on the severity of the injury, and transported to the nearest medical facility, if needed.

Treatment of the injury is of primary concern and decontamination is secondary. The reported levels of radioactive contamination do not represent a significant hazard if decontamination can not be undertaken until a medical emergency is resolved. The OHP will complete the appropriate incident report, if warranted. See Section 4.4, Accident and Incident Reporting.

An emergency first-aid station will be established and will include a first-aid kit for onsite emergency first aid.

Provisions for emergency medical treatment shall include:

- At least one individual qualified to render first aid and Cardiopulmonary Resuscitation (CPR) will be assigned to each shift.

- Emergency first aid stations will be established in the immediate work vicinity.

- Phone numbers and procedures for contacting ambulance services, fire department, police, and medical facilities will be conspicuously posted.
- Maps and directions to a medical trauma center will be posted for ambulatory medical emergencies.
- Evacuation routes and gathering area locations shall be posted around the site.

4.3 ACCIDENT AND INCIDENT REPORTING

All accidents, injuries, or incidents will be reported to the Project Superintendent and the OHP. The accident/incident will be reported as soon as possible to the employee's supervisor. An accident/incident form will be completed by the OHP, and a copy will be forwarded to the Construction Manager. A copy of the form is shown as Figure 4.1.

FIGURE 4.1 (PAGE 1 OF 3)
ACCIDENT/EXPOSURE INVESTIGATION REPORT

COMPANY		DATE
INVESTIGATION TEAM		
EMPLOYEE'S NAME & ID		
SEX	AGE	JOB DESCRIPTION
DEPARTMENT & LOCATION		
ACCIDENT DATE & TIME		
DATE & TIME ACCIDENT REPORTED TO SUPERVISOR		
NATURE OF INCIDENT		
NATURE OF INJURY		
REFERRED TO MEDICAL FACILITY/DOCTOR ☐ YES ☐ NO		
EMPLOYEE RETURNED TO WORK ☐ YES DATE/TIME ____________ ☐ NO		
☐ INJURED EMPLOYEE INTERVIEW/STATEMENT – ATTACHED		
WITNESSES		
☐ WITNESSES INTERVIEWS/STATEMENTS – ATTACHED		
☐ PHOTOGRAPHS OF SITE – ATTACHED		
☐ DIAGRAMS OF SITE - ATTACHED		
EQUIPMENT RECORDS - ATTACHED - REVIEWED ☐ YES ☐ NO		
ACCIDENT/EXPOSURE INCIDENT DESCRIPTION		

FIGURE 4.1 (PAGE 2 OF 3)
ACCIDENT/EXPOSURE INVESTIGATION REPORT

Accident Description			
Date & Time		Location	
Preventative Action Recommendations			
Corrective Actions Completed	Manager Responsible	Date Completed	
Employee Lost Time - Temporary Help - Cleanup - Repair - Discussion			
Accident Cost Analysis	Investigation	Compliance	Total Cost
Medical			
Production Loss			
Report Prepared By		Date Completed	
Safety Committee Review ☐ Yes ☐ No			
Corrective Action		Date Started	
Safety Communication Notice Prepared		Date	
Safety Director Signature			

FIGURE 4.1 (PAGE 3 OF 3)
ACCIDENT/EXPOSURE INVESTIGATION REPORT

ACCIDENT DESCRIPTION	
DATE & TIME	LOCATION
EMPLOYEES INVOLVED	
EMPLOYEE INTERVIEW/STATEMENT - INJURED EMPLOYEE – WITNESS	
EMPLOYEE NAME	
INTERVIEWED BY	

ACCIDENT DIAGRAM/PHOTOGRAPHS

5.0 TRAINING

All site personnel shall be trained and certified in accordance with 29 CFR 1910.120.

5.1 PROJECT-SPECIFIC TRAINING

Prior to project start-up, all assigned personnel shall receive an initial project-specific training session. This training shall include, but not be limited to, the following areas:

- Review of the Radiological Health and Safety Plan;
- Review of applicable radiological and physical hazards;
- PPE levels to be used by site personnel;
- Site security control;
- Emergency response and evacuation procedures;
- Project communication;
- Required decontamination procedures;
- Prohibited on-site activities;
- Instructions to workers in accordance with 32 IAC 400 and 29 CFR 1910.1096(i)(2); and
- U.S. NRC Regulatory Guide 8.13 and Declared Pregnant Worker Policies.

5.2 VISITOR ORIENTATION

All non-essential personnel and visitors who plan to enter the containment area will be briefed on the RHASP requirements and the requirements in 32 IAC 400.120 and 29 CFR 1910.1096(i)(2) requirements prior to entry with a trained site escort. In addition, female visitors will be instructed regarding U.S. NRC Regulatory Guide 8.13 and Declared Pregnant Worker Policies.

5.3 RADIATION SAFETY TOOLBOX MEETINGS

Before the start of the work, and, on the first work day of each following work week, the OHP will assemble the site personnel for a brief radiological safety meeting. The purpose of these meetings will be to discuss project status, problem areas, conditions, safety concerns, PPE levels and to reiterate RHASP requirements. The OHP will complete a Radiological Safety Meeting Report (Figure 5.1) to indicate the contents of the meeting and the attendees.

5.4 FIRST AID

At least one (1) individual, trained and qualified to administer first aid and CPR in accordance with American Red Cross requirements, will be present at the site.

FIGURE 5.1 (PAGE 1 OF 2)

RADIOLOGICAL SAFETY MEETING REPORT

DATE	DIVISION	DEPARTMENT	DURATION OF MEETING	
			FROM: ☐ A.M. ☐ P.M.	TO: ☐ A.M. ☐ P.M.
NUMBER PRESENT	NUMBER ABSENT	MEETING CONDUCTED BY	DID MEETING INCLUDE REQUIRED TRAINING? ☐ YES (DESCRIBE BELOW) ☐ NO	

SUPERVISOR'S PRESENTATION	DISCUSSION OF SAFE/UNSAFE WORK PRACTICES, MATERIALS, PRECAUTIONS, HAZARDS, EQUIPMENT FAMILIARIZATION, ETC.
EMPLOYEE FEEDBACK	COMMENTS, QUESTIONS, COMPLAINTS, ETC.
SUPERVISOR'S CORRECTIVE ACTION PLAN	KNOWN PLANS FOR CORRECTION, PARTS ON ORDER, ITEMS TO BE DISCUSSED WITH DEPARTMENT HEAD, AND CORRECTION OF ITEMS PREVIOUSLY SUBMITTED
DEPARTMENT HEAD COMMENTS	

SUPERVISOR	DEPARTMENT HEAD
FACILITY MANAGER	HAVE EMPLOYEES ATTENDING SIGN ON REVERSE SIDE, FORWARD A COPY TO THE LOCAL SAFETY DEPARTMENT

FIGURE 5.1 (PAGE 2 OF 2)
RADIOLOGICAL SAFETY MEETING REPORT

TO BE SIGNED BY ALL EMPLOYEES ATTENDING THE MEETING			
I HAVE RECEIVED AND UNDERSTAND THE INFORMATION AND / OR TRAINING INDICATED ON THE REVERSE SIDE.			
SIGNATURE	**DATE**	**SIGNATURE**	**DATE**

LIST ALL EMPLOYEES ABSENT FROM THE MEETING	

6.0 PERSONNEL EXPOSURE AND AIR QUALITY MONITORING

6.1 AIR QUALITY (DUST)

Due to the nature of the principal contaminants associated with the project, dust suppression will be important as a means of minimizing exposure levels and off-site migration of contaminants. The OHP will routinely monitor the project area. The OSHA permissible exposure limit (PEL) for nuisance dust is 15 mg/m^3.

6.2 AIRBORNE RADIOACTIVITY

Monitoring for airborne radioactivity exposure requires the following elements:

- Air sampling for radioactive particulates,
- Recordkeeping regarding personnel work locations and time in location, and
- Respiratory protective equipment records regarding devices used by workers in airborne radioactivity areas and their protective factors.

By monitoring these three elements, a continuous record of personnel exposure to airborne radioactivity is maintained.

Personal samplers will be used to monitor for occupational exposure to airborne radioactivity. Samples shall be analyzed daily to determine potential contributions to dose from radionuclides. Additional evaluation of samples shall be performed when necessary after allowing time for decay of interfering radionuclides.

Environmental monitoring of the work areas will be performed for radioactive particulate activity. Area air samplers shall run continuously in and outside of containment. High volume grab samplers shall be run early each day outside of containment to provide rapid measurement of airborne contaminants. Samples shall be evaluated daily for gross alpha activity. Background data (on the north side of the fifth and fourth floors) and preremediation data (on the south side of the fifth and fourth floors) shall be collected at the locations selected for sampling prior to the start of activities. The exact location of these samples will be determined after final erection of the containments on these floors. Additional evaluation of samples shall be performed when necessary after allowing time for decay of interfering radionuclides.Samples shall be analyzed using methods and equipment that have MDAs below the activities in the collected volumes at the concentration limits. Air samples shall be collected on 0.8 µm membrane or 0.3 µm glass fiber media. Laboratory analysis of air samples shall be performed using an internal proportional counter, alpha scintillation detector, or alpha spectrometer. Field analysis of air samples shall be performed using an alpha scintillation detector.

6.3 INTERNAL MONITORING

Internal monitoring to determine intakes of radioactive material will be performed as needed, based upon the results of the air sampling program. Bioassay methods may be in-vivo (whole body counting) or invitro. Routine bioassay of workers is not anticipated based upon the low concentrations of radioactivity in concrete that is being removed.

6.4 EXTERNAL RADIATION MONITORING

External radiation monitoring of workers will be performed using the dosimeters provided and processed by a service holding National Voluntary Laboratory Accreditation Program (NVLAP) certification. Direct reading pocket dosimeters will be used for visitors and other infrequent personnel requiring access to the site.

6.5 RADIOLOGICAL SURVEYS

Radiological surveys will be performed to ensure that radiation levels and contamination levels are controlled to the action levels in Table 6.1 for workers and the general public. Radiation surveys will consist of ambient gamma surveys and contamination surveys.

6.6 CONTAMINATION MONITORING

Surveys of CRA equipment and material shall be performed to ensure that radioactivity is below the action levels in Table 6.1 before leaving the site. Decontamination will be performed to maintain contamination levels ALARA.

Site personnel shall be surveyed by the OHP when exiting containment to ensure that contamination in excess of 0.3 times the action levels in Table 6.1 is not present on skin or clothes. The PHP will be immediately informed about any contamination on individuals and will recommend appropriate decontamination techniques. Proper disposition of contaminated personal effects and clothing will be the responsibility of the OHP (see LOP page 3 for expected disposition of material). Surveys for total (fixed) contamination shall be performed with a pancake, proportional, air proportional, or alpha scintillation probe. Surveys for removable contamination shall be performed by wiping the surface with wipe test material and analyzing the wipe. Laboratory analysis of wipes shall be performed using an internal proportional counter, alpha scintillation detector, or alpha spectrometer. Field analysis of wipes shall be performed using an alpha scintillation detector, or a pancake probe. Dose rate shall be measured using a tissue equivalent multiplying ion chamber. Exposure rate shall be measured using an energy compensated GM probe or an ion chamber.

6.7 ACTION LEVELS

6.7.1 Radiological Action Levels

Radiological exposure of on-site workers will be determined by external dosimetry and by air sampling. The OHP will perform radiological monitoring. Action levels are in Table 6.1.

Engineering controls such as the use of water to minimize dust levels will be implemented as necessary during mitigation activities. See the CRA LOP.

TABLE 6-1

ACTION LEVELS

Personnel shall not be exposed, in 40 working hours, to airborne radioactivity in excess of 12 Maximum Permissible Concentration (MPC)-hours without prior approval of the PHP or the OHP. The MPCs incorporated in 29 CFR 1910.1096 are those that were in Table 1 of appendix B to 10 CFR 20 in 1971 when OSHA promulgated the standard. Level of protection may be increased to full-face air purifying respirators when airborne monitoring indicates that airborne concentrations of radioactive material reached 30% of the MPC. All assessments shall incorporate ALARA principles. Engineering controls shall be used prior to increasing the level of respiratory protective equipment.

Areas where airborne radioactivity levels exceed, or have a reasonable potential to exceed, 25% of the MPC averaged over on week, or exceeds the MPC at any time shall be posted "Caution: Airborne Radioactivity Area".

Radiation Type	Action Level	Level of Respiratory Protection/Action
a. Contamination on wipe samples	The levels in Table 6.1 for CRA equipment and material released to Unrestricted. The levels in Table 6.1 do not apply to walls, floors, or fixed utilities.	Decontaminate to the levels in Table 6.1
b. Airborne Radioactivity (work areas)	12 MPC hours in a week The MPC for Th-Nat is 3×10^{-11} µCi/ml	Perform a health physics evaluation to determine appropriate respiratory equipment based upon the required PF and ALARA principles. Ensure proper posting. Perform a health physics evaluation to determine the need internal monitoring
c. Airborne Radioactivity (off-site areas)	2.4×10^{-13} µCi -hours /ml in a week	Perform a health physics evaluation to determine the need to revise dust control and containmemt procedures
d. Ambient Gamma (work areas)	5 mrem/hr[c] or 100 mrem in a week	Perform a health physics evaluation to determine the required for shielding. Ensure proper posting.
e. Ambient Gamma (off-site areas)	1 mrem/hr[d] or 50 mrem in a year	Implement immediate controls to reduce dose equivalent rate.

Notes

(a) The values in Table 6.2 are from 32 IAC 340.APPENDIX A Decontamination Guidelines

(b) Potential Airborne Radioactivity Area as defined in 29 CFR 1910.1096 (e)(4). Workers exposed to 32 MPC-hours in a week must wear a full-face APR until the end of the week.

(c) The ambient gamma dose equivalent rate action level of 5 mrem/hr is from 29 CFR 1910.1096 (c)(3)(ii) Radiation Area definition. If the ambient gamma dose equivalent rate reaches 2 mrem/hr, one or more of the following actions may be implemented: The source may be shielded; the working distance from the source may be increased; or the worker's exposure time may be limited.

(d) The ambient gamma action level for off-site is based upon the 32 IAC 340 Subpart D requirements to maintain dose equivalents in unrestricted areas such that they do not exceed 0.002 rem in any one hour or 0.1 rem in any one year

TABLE 6-2

ACTION LEVELS

The values listed in 32 IAC 340.APPENDIX A Decontamination Guidelines are used in determining that equipment and CRA controlled materials are suitable for release for unrestricted use. These are not the same as the Acceptable Radiation Level (ARL) used to measure the success of mitigation activities.

Alpha			
	Removable	555 mBq per 100 cm^2 =	average
		15 pCi per 100 cm^2	over any
		33 dpm per 100 cm^2	one surface
		1.67 Bq per 100 cm^2 =	maximum
		45 pCi per 100 cm^2	
		100 dpm per 100 cm^2	
	Total (Fixed)	16.7 Bq per 100 cm^2 =	average
		450 pCi per 100 cm^2	over any
		1,000 dpm per 100 cm^2	one surface
		83.3 Bq per 100 cm^2 =	maximum
		2,250 pCi per 100 cm^2	
		5,000 dpm per 100 cm^2	

Gamma

250 microrem per hour at 1 cm from surface
gamma radiation measured at a distance of 100 centimeters from the surface shall not exceed background

7.0 PERSONAL PROTECTIVE EQUIPMENT

It is anticipated that most activities outside containment will be performed in Section 1 personal protective equipment (PPE), with a contingency for upgrade, based on the action levels listed in Section 6. Section 2 equipment will be used when in containment, or when directed by the OHP.

1. To be worn during interior demolition:
    a. Hard hat
    b. Safety Glasses
    c. Steel toe boots with metatarsal protection
    d. Cotton coveralls
    e. Respirators: Half-face with HEPA filters
    f. Leather gloves
    g. Full body harness with lanyard (if exposed to a fall hazard > 6')
    h. Earplugs (if working around loud equipment, i.e. electric saws, pneumatic hammers, etc)

2. To be worn in containment:
    a. Hard hat
    b. Safety Glasses
    c. Steel toe boots with metatarsal protection
    d. Tyvek suit
    e. Respirator: Half-face with HEPA filters (upgrade to full-face if needed)
    f. Nitrile gloves (and/or leather gloves when handling heavy/sharp material or equipment)
    g. Earplugs (if working around loud equipment, i.e. electric saws, pneumatic hammers, etc)

Action levels used to determine the need to upgrade or downgrade the levels of protection are described in Section 6.0 of this RHASP.

8.0 CONTAMINATION REDUCTION PROCEDURES

8.1 EQUIPMENT DECONTAMINATION

Equipment will be decontaminated using a HEPA vacuum and wet wipes, and if necessary, a detergent solution. A need for chemical cleaning is not anticipated.

8.2 PERSONNEL DECONTAMINATION

If surveys indicate that individuals have been decontaminated by removing protective coveralls and showering, they may leave the work-site. If individuals cannot be decontaminated by the removal of coveralls and showering, they will be evaluated by the OHP.

If skin contamination in excess of the 0.3 times the Action Levels in Table 6.2 is measured on an individual working with radioactive materials, the following specific procedures should be used to prevent fixation of the material on the skin or absorption of the radioactivity through the skin.

Immediate Action: Notify the OHP and CRA's Safety Manager, who will supervise the decontamination. If contamination is spotty, the OHP will supervise the cleaning of the individual areas with soap and water. If the contamination is general, the OHP will recommend showering. Rinse, dry, and monitor for radioactivity. This soap wash step may be repeated up to three times.

Evaluation: If the above procedure fails to remove all the skin contamination, an evaluation of the skin contamination should be performed by the OHP. This evaluation shall identify the radionuclides and quantity and estimate the skin dose. If additional decontamination steps are necessary, they will be performed and documented by the OHP. The guidelines for personnel decontamination in the Radiological Health Handbook, HEW 1970, page 194, can be used as applicable. These guidelines are in Appendix A.

8.3 WORK ZONES

Work zones will be established at the site. These zones include clean/support zones, decontamination zones, and containment. Known contaminated areas where containment is to be established during the mitigation are shown on Figure 3.1. Although the clean/support zones are anticipated to remain fixed, other zones will move as remediation work progresses. See the CRA LOP.

8.4 CONTAMINATION PREVENTION

Work practices that minimize the spread of contamination will reduce worker exposure and help ensure valid sample results by precluding cross-contamination. Procedures for contamination avoidance include:

- knowing the limitations of all personal protective equipment being used;
- avoiding walking through areas of obvious or known contamination;
- refraining from handling or touching contaminated materials directly (do not sit or lean on potentially contaminated surfaces);
- ensuring personal protective equipment has no cuts or tears prior to donning;
- fastening all closures on suits and covering with tape if necessary;

- taking steps to protect against any skin injuries; and
- Refraining from eating, chewing gum, smoking, or engaging in any activity from which contaminated materials may be ingested while in contaminated areas.

8.5 DISPOSAL PROCEDURES

All discarded materials, waste materials, or other field equipment and supplies should be handled in such a way as to avoid spreading of contamination, creating a sanitary hazard, or causing litter to be left on-site. All potentially contaminated waste materials (e.g., clothing, gloves) shall be monitored and segregated in accordance with monitoring results into either radioactive or non-radioactive waste. Required labels shall be affixed to containers of radioactive materials (i.e. CAUTION: RADIOACTIVE MATERIALS).

Appendix A:

Radiological Health Handbook

Personnel Decontamination

PERSONNEL DECONTAMINATION

Method*	Surface	Action	Technique	Advantages	Disadvantages
Soap and water	Skin and hands	Emulsifies and dissolves contaminate.	Wash 2-3 minutes and monitor. Do not wash more than 3-4 times.	Readily available and effective for most radioactive contamination.	Continued washing will defat the skin. Indiscriminate washing of other than affected parts may spread contamination.
Soap and water	Hair	Same as above.	Wash several times. If contamination is not lowered to acceptable levels, shave the head and apply skin decontamination methods.		
Lava soap, soft brush, and water	Skin and hands	Emulsifies, dissolves, and erodes.	Use light pressure with heavy lather. Wash for 2 minutes, 3 times. Rinse and monitor. Use care not to scratch or erode the skin. Apply lanolin or hand cream to prevent chapping.	Same as above.	Continued washing will abrade the skin.
Tide or other detergent (plain)	Same as above.	Same as above.	Make into a paste. Use with additional water with a mild scrubbing action. Use care not to erode the skin.	Slightly more effective than washing with soap.	Will defat and abrade skin and must be used with care.

*Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

APPENDIX H

MODEL INNOCENT LANDOWNER CONFIRMATION LETTER

DRAFT APPENDIX H

[U.S. EPA – Region 5 Letterhead]

[Date]

Mr. Alfred E. D'Ancona III
C/O Wilson P. Funkhouser, Esq.
Funkhouser, Vegosen, Liebman & Dunn LTD
55 West Monroe Street
Suite 2410
Chicago, Illinois 60603

RE: Confirmation of Innocent Landowner Defense Status – Current Owners - Fairbanks & Ohio Autopark, Chicago, Illinois

Dear Mr. D'Ancona:

Based upon a review of the materials provided in anticipation, review, support, and completion of the removal action activities undertaken at the at the property located at the southwest corner of East Ohio Street and North Fairbanks Court in Chicago, Illinois ("Fairbanks & Ohio Autopark" or "Site"), and considering the environmental benefits derived from said removal activities, the United States Environmental Protection Agency ("USEPA" or "Agency") hereby confirms that the Current Owners, as defined below, of the Fairbanks & Ohio Autopark qualify for the "innocent landowner defense" to liability under the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. § 9601, *et seq.*

The current owners of the Fairbanks & Ohio Autopark are as follows:

ALFRED E. D'ANCONA AND LAWRENCE R. LEVIN, TRUSTEES OF THE ALFRED E. D'ANCONA III TRUST, U/W/O HENRY R. LEVY and ALFRED E. D'ANCONA III and TERRI R. D'ANCONA, TRUSTEES OF THE H. RICHARD D'ANCONA CHILDREN'S TRUST, DATED JUNE 3, 1994 (herein collectively referred to as "Current Owners").

Pursuant to Section 107(b)(3) of CERCLA, 42 U.S.C. § § 9607(b)(3), current owners are not liable for a "release" of hazardous materials if the following conditions are established:

1. the release of hazardous materials were caused solely by a third party;
2. the third party's act did not occur in connection with contractual relationship with the present owners;
3. the current owners exercised due care with respect to hazardous substances; and
4. The current owners have taken precautions against the third party's foreseeable acts and consequences.

Establishment of the above four (4) conditions are collectively referred to as the "Innocent Landowner Defense." For purposes of condition number 2, a "contractual relationship" includes real estate contracts and deeds, except that the current owners are *not* liable if they acquired the property "by inheritance or bequest." (42 U.S.C. § 9601(35)(A); 42 U.S.C. §§ 9607(b)(3)(a) and (b)).

Based upon information provided by the Current Owners to the Agency, as well as Site-specific information concerning the Fairbanks & Ohio Autopark and the area of the City of Chicago in which is located, the Agency concludes and confirms that the Current Owners have established the Innocent Landowner Defense under CERCLA Section 107(b)(3), 42 U.S.C. § 9607(b)(3) for the following reasons:

- The Current Owners acquired the Site by bequest in 1975;
- The Site is located in a neighborhood of the City of Chicago just north of the Chicago River and east of Michigan Avenue known as Streeterville. Streeterville was originally a low, marshy area, but began to be filled in the late nineteenth century, with rubble from the Great Chicago Fire of 1871 as well as with other fill material;
- In the late-1990s, it became known that subsurface soils in Streeterville might be contaminated with thorium from historic Lindsay Light operations;
- In 2001, following a radiological survey of portions of Streeterville, the Agency determined that the Site may have been impacted with radioactive thorium fill materials. This determination was communicated by letter to the Current Owners;
- Lindsay Light Chemical Company ("Lindsay Light") is the possible source of the thorium contamination located at the Site. From approximately 1910 to 1933, Lindsay Light manufactured incandescent mantles for gas lanterns in Streeterville using solutions that contained radioactive thorium. During at least part of this period, Lindsay Light refined monazite (thorium-containing ore) in Streeterville and generated quantities of tailings that also contained radioactive material. Tailings and other material from Lindsay Light's operations were used as fill in the Streeterville area in the early twentieth century;
- Prior to removal actions undertaken at the Site, areas of radioactive thorium were entombed beneath asphalt paving; the asphalt attenuating any surface radiation to essentially background levels;
- The Site had been a paved parking lot since 1958, until commencement of thorium removal activities conducted thereon, beginning in 2004;
- The historic paving of the Site precluded any new deposits or release of thorium on or from the Site from 1958 to 2004;
- Lindsay Light never owned the Site;
- The Current Owners have exercised due care regarding possible thorium contamination since learning of the possibility in 2001 from the Agency.

Accordingly, the Agency concludes and confirms that, pursuant to Section 107(b) of CERCLA, 42 U.S.C. 9607(b), the Current Owners are not liable for cleanup obligations that otherwise might be imposed under CERCLA. Please feel free to contact the undersigned if you have any questions.

Very truly yours,

____
[Authorized USEPA Representative]

APPENDIX I

MODEL BONA FIDE PROSPECTIVE PURCHASER CONFIRMATION LETTER

DRAFT APPENDIX I

[U.S. EPA - Region 5 Letterhead]

[Date]

Fairbanks Development Associates
C/O Thomas R. Carey, Esq.
Bell, Boyd & Lloyd LLC
70 West Madison Street
Suite 3300
Chicago, Illinois 60602-4207

RE: Confirmation of Bona Fide Prospective Purchaser Status - Fairbanks & Ohio Autopark, Chicago, Illinois

Dear Fairbanks Development Associates:

Based upon a review of the materials provided in anticipation, review, support, and completion of the removal action activities undertaken at the property located at the southwest corner of East Ohio Street and North Fairbanks Court in Chicago, Illinois ("Fairbanks & Ohio Autopark"), and considering the environmental benefits derived from said removal activities, the United States Environmental Protection Agency ("USEPA") hereby confirms that Fairbanks Development Associates ("FDA") is a "bona fide prospective purchaser" as defined at Section 101(40) of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. § 9601(40), and that FDA has established, by a preponderance of evidence, the following:

- Any "disposal" at the Fairbanks & Ohio Autopark occurred prior to FDA's acquisition of same;

- FDA made all appropriate inquiry into previous ownership and uses of the Fairbanks & Ohio Autopark in accordance with generally accepted practices and in accordance with the standards contained at Section 101(35)(B) of CERCLA;

- FDA provided all legally required notices with respect to hazardous substances found at the Fairbanks & Ohio Autopark;

- FDA has exercised "appropriate care" with respect to hazardous substances found at the Fairbanks & Ohio Autopark by taking "reasonable steps" to: (a) stop any continuing releases; (b) prevent any threatened future release; and (c) prevent or limit human, environmental, or natural resource exposure to any previously released hazardous substance;

- FDA has provided full cooperation and access to the Fairbanks & Ohio Autopark to USEPA and those authorized to conduct and/or oversee response actions;

- FDA is in full compliance with any land use restrictions at the Fairbanks & Ohio Autopark and has not impeded the effectiveness or integrity of any institutional control;

- FDA has complied with any information request or administrative subpoena under CERCLA; and

- FDA is not potentially liable for response costs at the Fairbanks & Ohio Autopark or "affiliated" with any such person through: (a) direct or indirect familial relationship; or (b) any contractual, corporate, or financial relationship (excluding relationships created by instruments conveying or financing title or by contracts for sales of goods or services).

Furthermore, USEPA confirms that FDA's status as a bona fide prospective purchaser as outlined above for the Fairbanks & Ohio Autopark, entitles it to the limitation on liability established at Section 107(r) of CERCLA, 42 U.S.C. § 9607(r). Please feel free to contact the undersigned if you have any questions.

Very truly yours,

____

[Authorized USEPA Representative]